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A check list and host-index of the species of the protozoan genus *Eimeria*.[1]

A. B. HARDCASTLE,[2] Duke University, Durham, North Carolina.

INTRODUCTION

The most recent catalogue of the species belonging to the genus *Eimeria* is that of Levine and Becker in 1933. In this they list 220 species from 183 hosts. Interest in the coccidia has increased rapidly since that time and it now seems desirable that the resulting literature should be brought together for the benefit of those working in the field.

In this paper 369 species are recorded from 368 hosts. In addition synonyms and homonyms are listed. A complete synonymy of this genus has not been made in recent years, and the writer has not attempted it without full recognition of the difficulties involved. In the face of such difficulties, many of them peculiar to a field in which types cannot be preserved, the only course open is to accept the nomenclature of those familiar with the species that parasitize each group of hosts. It is evident that such a classification will not be entirely satisfactory. The writer hopes, however, that this list of species will stimulate interest in the taxonomic problems involved and possibly pave the way for a more satisfactory classification.

In the first section of this paper the names of all species recognized as valid are listed alphabetically. In addition to these, other species which are questionable have been included and are indicated in the following manner: A question mark before the name means that the whole reference is questionable; after the generic name, that the genus is questionable; and after the specific name, that the validity of the species has been questioned. Following the name of each species are measurements denoting range of size of the oöcysts (R), or mean size of the oöcysts (M), in microns. Under each species the names of the hosts from which it has been reported are given. Except in the case of obvious errors, the names of the hosts are listed as recorded by the original authors.

Unnamed or unidentified species of the genus *Eimeria* have been reported from nearly a hundred hosts, but for many reasons they have not been included in this list. References to them are on file in the Index-Catalogue of Medical and Veterinary Zoology, Zoological Division, U. S. Bureau of Animal Industry, Beltsville Research Center, Beltsville, Maryland.

Following the names of the valid species is a list of species and specific names which have appeared in combination with *Eimeria*, but which are not now regarded as valid members of this genus. This list includes synonyms, homonyms, lapsi, nomina nuda, and species which have been moved to other genera.

In the second section, the species are arranged according to the hosts they parasitize. In using this section it should be remembered that in many cases the original authors recorded only the common name of the host. In such cases it has seemed wiser to list the common names alphabetically and not attempt to identify the host.

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[2] Now with U. S. Bureau of Animal Industry, Beltsville Research Center, Beltsville, Maryland.

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SPECIES INDEX

Genus *Eimeria* Schneider, 1875

Synonyms.—Gregarina Eimer, 1870 pro parte; *Cytospermium* Rivolta, 1878 pro parte; *Psorospermium* Rivolta, 1878 pro parte; *Coccidium* Leuckart, 1879 pro parte; *Orthospora* Schneider, 1881 pro parte; *Karyophagus* Steinhaus, 1889; *Cytophagus* Steinhaus, 1891; *Acystis* Labbé, 1894a; *Pfeifferia* Labbé, 1894b; *Bananella* Labbé, 1895; *Goussia* Labbé, 1896; *Crystallospora* Labbé, 1896; *Pfeifferella* Labbé, 1899; *Paracoccidium* Laveran and Mesnil, 1902a; *Jarrina* Léger and Hesse, 1922.

E. acanthodactyli (Phisalix, 1930) Levine and Becker, 1933; (M) 31.5 × 21.
Synonym.—Coccidium acanthodactyli Phisalix, 1930.
Host.—Acanthodactylus scutellatus. Sauria.

E. acervulina Tyzzer, 1929; (M) 19.5 × 14.3.
Hosts.—Colinus virginianus virginianus; Gallus domesticus; Lophortyx californica vallicola; Oreortyx picta plumifera. Aves.

E. adleri Yakimoff and Gousseff, 1936f; (M) 17.4 × 15.3.
Host.—"Gelben Fuchs." Carnivora.

E. aesculapi Carini, 1933b; (M) 15 × 13.
Host.—Erythrolamprus aesculapi. Serpentes.

E. agamae (Laveran and Petit, 1910) Reichenow, 1921; (R) 20–25 × 11–14.
Synonym.—Coccidium agamae Laveran and Petit, 1910.
Host.—Agama colonorum. Sauria.

E. aguti Carini, 1935; (R) 16–17.
Host.—Cotia vermelha. Rodentia.

E. ah-sa-ta Honess, 1942; (M) 32.69 × 23.7.
Hosts.—Ovis aries; Ovis canadensis canadensis. Artiodactyla.

E. alabamensis Christensen, 1941; (M) 18.9 × 13.4.
Host.—Bos taurus. Artiodactyla.

E. alactagae Iwanoff-Gobzem, 1934b; (R) 22.3–26.4.
Host.—Alactaga jaculus. Rodentia.

E. alburni (Stankovitch, 1920) Yakimoff, 1929b; (R) 19–20.
Synonym.—Goussia alburni Stankovitch, 1920.
Hosts.—Cyprinus gobio; Leuciscus rutilus; Scardinius erythrothalmus. Pisces.

E. amarili Pinto, 1928a; (M) 19.6 × 16.8.
Host.—Bothrops neuwiedii. Serpentes.

E. amydae Roudabush, 1937a; (M) 19.55 × 14.60.
Host.—Amyda spinifera. Testudinata.

E. andrewsi Yakimoff and Gousseff, 1935a; (M) 20.9 × 15.2.
Host.—"Eichhörnchen." Rodentia.

E. anguillae Léger and Hollande, 1922; (M) 10.
Host.—Anguilla vulgaris. Pisces.

E. angusta Allen, 1934; (R) 16.5–17.5 × 27–33.
Hosts.—Bonasa umbellus; Canachites canadensis; Centrocercus urophasianus; Pediocetes phasianellus campestris; Tetrastes bonasia. Aves.

E. anseris Kotlan 1932, emend. Kotlan, 1933; (R) 16–23 × 12–18.
Host.—Anser anser anser. Aves.

E. antelocaprae Huizinga, 1942; (M) 30.8 × 26.
Host.—Antelocaprae americana. Artiodactyla.

E. arctica Yakimoff, Matschoulsky and Spartansky, 1939; (M) 35.3 × 28.
Host.—Rangifer tarandus. Artiodactyla.

E. arctomysi Galli-Valerio, 1931; (M) 24 × 20.
Host.—Arctomys marmota. Rodentia.

E. arkhari Yakimoff and Matschoulsky, 1937a; (R) 20–24 × 18–20.
Hosts.—Ovis arkhar; Ovis polii polii; Ovis polii sewerzowi; Ovis vignei. Artiodactyla.

E. arloingi (Marotel, 1905) Martin, 1909; (M) 27 × 18.
Synonyms.—Coccidium arloingi Marotel, 1905; *Eimeria aemula* Yakimoff, 1931b.

Hosts.—Capella rupicapra; Capra hircus; Capra hircus angoriensis; Capra ibex; Hemmitragus jemlaicus; Ovis aries; Ovis aries germanica; Ovis aries platygura var. *astracanensis; Ovis aries steatopyga; Ovis aries steatopyga* var. *somalica; Ovis aries strepsiceros* var. *hortob; Ovis musimon; Ovis polii polii; Ovis polii sewerzowi.* Artiodactyla.

E. arnoldoi Pinto and Maciel, 1929; (R) 30 × 14–15.
Host.—Tamnodynastes strigilis. Serpentes.

E. arvicolae (Galli-Valerio, 1905) Reichenow, 1921; (R) 14–18.
Synonyms.—Eimeria arvalis (Galli-Valerio, 1905), *lapsus; Coccidium arvicolae* Galli-Valerio, 1905.
Hosts.—Arvicola nivalis; Microtus arvalis. Rodentia.

E. asturi Galli-Valerio, 1935; (M) 10.5 × 6.
Host.—Astur palumbarius. Aves.

E. auburnensis Christensen and Porter, 1939; (M) 38.4 × 23.1.
Host.—Bos taurus. Artiodactyla.

E. azerbaidschanica Yakimoff, 1933b; (M) 45 × 21.6.
Synonym.—Eimeria azerbaidjhanaica Yakimoff, 1933b.
Hosts.—Bos taurus; Buffelus bubalus. Artiodactyla.

E. balozeti Yakimoff and Gousseff, 1938a; (R) 19.52–30.6 × 17.08–26.6.
Host.—Sturnus vulgaris. Aves.

E. beachi ? Yakimoff and Rastegaïeff, 1931; (M) 16.79.
Host.—Gallus domesticus. Aves.

E. ? beauchampi Léger and Duboscq, 1917.
Host.—Glossobalanus minutus. Hemichordata.

E. beckeri Yakimoff and Sokoloff, 1934; (M) oval 21.2 × 8.2; (M) round 19.
Host.—Citellus pygmaeus. Rodentia.

E. beecheyi Henry, 1932b; (M) 19.2 × 16.
Hosts.—Citellus beecheyi; Otospermophilus grammurus grammurus. Rodentia.

E. belawini Yakimoff, 1930; (M) 12.21.
Host.—Hyla arborea. Salientia.

E. bigemina (Labbé, 1896) Yakimoff, 1929; (R) 27–28.
Synonym.—Goussia bigemina Labbé, 1896.
Host.—Ammodytes tobianus. Pisces.

E. bilamellata Henry, 1932b; (M) 32 × 25.6.
Host.—Callospermophilus chrysodeirus. Rodentia.

E. bitis Fantham, 1932; (R) 27.9–36.4 × 17.8–24.3.
Host.—Bitis arietans. Serpentes.

E. bonasae Allen, 1934; (M) 21.
Hosts.—Bonasa umbellus; Canachites canadensis; Lagopus lagopus; Pediocetes phasianellus campestris; Tetrastes bonasia. Aves.

E. botelhoi Carini, 1932; (M) 36 × 28.
Host.—Guerlinguetus ingrami. Rodentia.

E. boveroi Carini and Pinto, 1926a; (M) 18.3.
Hosts.—Ameiva ameiva; Hemidactylus mabuia. Sauria.

E. bovis (Züblin, 1908) Fiebiger, 1912a; (M) 27.7 × 23.
Synonyms.—Coccidium bovis Züblin, 1908, pro parte; *Eimeria canadensis* Bruce, 1921, pro parte; *Eimeria smithi* Yakimoff and Galouzo, 1927.
Host.—Bos taurus. Artiodactyla.

E. brasiliensis Torres and Ramos, 1939; (M) 27.05 × 37.53.
Host.—Bos taurus. Artiodactyla.

E. brodeni Cerruti, 1930; (R) 18–20 × 28–32.
Host.—Testudo graeca. Testudinata.

E. brunetti Levine, 1942; (M) 21.7 × 26.8.
Host.—Gallus domesticus. Aves.

E. bukidnonensis Tubangui, 1931; (M) 48.6 × 35.4.
Hosts.—Bos taurus; Bibos indicus; Cervus elaphus. Artiodactyla.

E. cabassusi Carini, 1933a; (R) 21–33.
Host.—Cabassus unicinctus. Edentata.

E. callospermophili Henry, 1932b; (M) 19.2 × 16.
Host.—Callospermophilus chrysodeirus. Rodentia.

E. cameli Nöller, 1932, emend. Yakimoff and Matschoulsky, 1939b; (R) 21–33.6.
Synonym.—Eimeria cameli Iwanoff-Gobzem, 1934a, pro parte.
Host.—Camelus bactrianus. Artiodactyla.

E. canadensis Bruce, 1921; (M) 32.5 × 23.4.
Synonym.—Eimeria zurnabadensis Yakimoff, 1931a.
Hosts.—Bibos indicus; Bos taurus. Artiodactyla.

E. canaliculata Lavier, 1936; (R) 36–42 × 20–27.
Hosts.—Triton alpestris; Triton cristatus; Triton palmatus; Triton vulgaris. Caudata.
E. canis Wenyon, 1923; (R) 18–45 × 11–28.
Hosts.—Canis familiaris; Felis domestica. Carnivora.
E. canivelocis Gousseff, 1933; (M) 17.8 × 15.8.
Host.—"Silver fox." Carnivora.
E. canna Triffitt, 1924; (R) 23.5–34 × 16.5–20.
Host.—Orias canna. Artiodactyla.
E. capibarae Carini, 1937b; (M) 30 × 26.
Host.—Hydrochoerus capibara. Rodentia.
E. capreoli Galli-Valerio, 1927; (M) 24 × 13.
Hosts.—Capella rupicapra; Cervus capreolus. Artiodactyla.
E. carassii Yakimoff and Gousseff, 1935b; (R) 19.52–24.40.
Host.—Carassius carassius. Pisces.
E. carpelli Léger and Stankovitch, 1921; (R) 13–14.
Host.—Cyprinus carpio. Pisces.
E. cati Yakimoff, 1933d; (M) 20.8 × 17.1.
Hosts.—Canis familiaris; Felis domestica. Carnivora.
E. caucasica Yakimoff and Beuwitsch, 1932; (M) 32.7 × 19.
Host.—"Berghühnern" (Mountain partridge). Aves.
E. caviae Sheather, 1924; (R) 17–25 × 13–18.
Hosts.—Cavia cobaya; Cavia operea; Cavia porcellus. Rodentia.
E. centrocerci Simon, 1939; (M) 22 × 17.
Host.—Centrocercus urophasianus. Aves.
E. cerastis (Chatton, 1912) Phisalix, 1921; (M) 40 × 20.
Synonym.—Coccidium cerastis Chatton, 1912.
Hosts.—Cerastis cornutus; Cerastis vipera. Serpentes.
E. cervi Galli-Valerio, 1927; (M) 33 × 21.
Hosts.—Capreolus capreolus; Cervus elaphus. Artiodactyla.
E. chagasi Yakimoff and Gousseff, 1935c; (M) 14.46.
Host.—Sorex araneus. Insectivora.
E. chrysemedis Deeds and Jahn, 1939; (M) 33 × 15.
Host.—Chrysemys marginata bellii. Testudinata.
E. citelli Kartchner and Becker, 1930; (M) 18.8 × 15.8.
Hosts.—Citellus pygmaeus; Citellus tridecemlineatus. Rodentia.
E. clini Fantham, 1932; (R) 13.6–17.7 × 11.8–15.
Host.—Clinus superciliosus. Pisces.
E. clupearum (Thelohan, 1894) Doflein, 1909; (R) 18–21.
Synonyms.—Coccidium sp. Thelohan, 1892; *Coccidium clupearum* Thelohan, 1894; *Goussia clupearum* (Thelohan, 1894) Labbé, 1896; *Eimeria wenyoni* Dobell, 1919.
Hosts.—Alosa sardina; Clupea harengus; Clupea pilchardus; Engraulis encrasicholus; Sardina melanosticta; Scomber scomber. Pisces.
E. cnemidophori Carini, 1941b; (M) 18 × 17.
Host.—Cnemidophorus lemniscatus lemniscatus. Sauria.
E. cobitis Stankovitch, 1924a; (R) 14–15 × 7.
Host.—Cobitis taenia. Pisces.
E. coelopeltis (Galli-Valerio, 1926) Hoare, 1933; (M) 10.5 × 6.
Synonym.—Isospora coelopeltis Galli-Valerio, 1926.
Host.—Coelopeltis lacertina. Serpentes.
E. columbae Mitra and Das Gupta, 1937; (M) 16.4 × 14.35.
Host.—Columba intermedia. Aves.
E. columbarum Nieschulz, 1935; (R) 19–21 × 17.5–20.
Host.—Columba livia livia. Aves.
E. cotiae Carini, 1935; (M) 29 × 18.
Host.—Cotia vermelha. Rodentia.
E. cotti Gauthier, 1921; (R) 10–11.
Synonym.—Eimeria votti Gauthier, 1921, lapsus.
Host.—Cottus gobio. Pisces.
E. coypi Obitz and Wadowski, 1937; (M) 22.8 × 14.7.
Host.—Myocastor coypus. Rodentia.
E. cristalloides (Thelohan, 1893) Doflein, 1909; (R) 20–25.
Synonyms.—Coccidium cristalloides Thelohan, 1893; *Crystallospora thelohani* Labbé, 1896.
Hosts.—Motella fusca; Motella maculata; Motella tricirrata. Pisces.

E. crocidura Galli-Valerio, 1933; (M) 16 × 12.7.
Host.—Sorex araneus. Insectivora.
E. crandallis Honess, 1942; (M) 21.89 × 19.37.
Host.—Ovis canadensis canadensis. Artiodactyla.
E. crotalae Phisalix, 1919; (M) 32 × 22.
Hosts.—Bitis gabonica; Crotalus terrificus. Serpentes.
E. cruciata (Thelohan, 1892) Yakimoff, 1929b; (M) 25.
Synonyms.—Coccidium cruciatum Thelohan, 1892; *Goussia cruciata* (Thelohan, 1892) Labbé, 1896.
Hosts.—Caranx trachurus; Trachurus trachurus. Pisces.
E. cylindrica Wilson, 1931; (M) 23.3 × 13.3.
Host.—Bos taurus. Artiodactyla.
E. cylindrospora Stankovitch, 1921; (R) 10–11.
Host.—Alburnus lucidus. Pisces.
E. cynomysis Andrews, 1928; (M) 35.36 × 30.04.
Host.—Cynomys ludovicianus. Rodentia.
E. cyprini Plehn, 1924; (M) 9.
Hosts.—Cyprinus carpio; Tinca tinca; Tinca vulgaris. Pisces.
E. cyprinorum Stankovitch, 1921; (R) 12–13.
Hosts.—Barbus fluviatilis; Leuciscus rutilus; Phoxinus laevis; Scardinius erythrothalmus. Pisces.
E. cystis-felleae Debaisieux, 1914; (R) 30–35 × 18–23.
Host.—Tropidonotus natrix. Serpentes.
E. debliecki Douwes, 1921; (M) 20.8 × 16.
Synonyms.—? Coccidium suis Jaeger, 1921; *Eimeria brumpti* Cauchemez, 1921; *Eimeria jalina* Krediet, 1921; *Eimeria suis* Nöller, 1921; *Eimeria tuis* Nöller, 1921, lapsus.
Hosts.—Sus scrofa; Sus scrofa ferus. Artiodactyla.
E. delagei (Labbé, 1893a) Reichenow, 1921; (R) 20–22 × 16–17.
Synonym.—Coccidium delagei Labbé, 1893a.
Hosts.—Cistudo europea; Emys orbicularis. Testudinata.
E. delagei var. *marginata* Deeds and Jahn, 1939; (R) 20–28 × 15–21.
Host.—Chrysemys marginata bellii. Testudinata.
E. dericksoni Roudabush, 1937a; (M) 14.55 × 12.88.
Host.—Amyda spinifera. Testudinata.
E. didelphydis Carini, 1936; (M) 16.
Host.—Didelphys aurita. Marsupialia.
E. dispersa Tyzzer, 1929; (M) 22.75 × 18.84.
Hosts.—Bonasa umbellus; Colinus virginianus virginianus; Coturnis communis; Gallus domesticus; Meleagris mexicana; Pediocetes phasianellus campestris; Phasianus colchicus colchicus; Phasianus colchicus torquatus. Aves.
E. dispersa (slow developing variety) Tyzzer, 1929.
Host.—Colinus virginianus virginianus. Aves.
E. dissimilis Yakimoff and Gouseff, 1935c; (M) 28.02 × 19.42.
Host.—Sorex araneus. Insectivora.
E. dromedarii Yakimoff and Matschoulsky, 1939b; (M) 27.2 × 23.2.
Synonyms.—Eimeria cameli Nöller, 1932, pro parte; *Eimeria cameli* Iwanoff-Gobzem, 1934a, pro parte.
Host.—"Camel." Artiodactyla.
E. dukei Lavier, 1927; (R) 20–24.
Hosts.—Nyctinomus limbatus; Nyctinomus pumilus. Chiroptera.
E. ekdysios Triffitt, 1928; (M) 29.6 × 17.7.
Host.—Tachypodoiulus niger. Diplopoda.
E. elegans Yakimoff, Gousseff and Rastegaïeff, 1932; (M) 34.2 × 19.8.
Host.—Gazella subgutturosa. Artiodactyla.
E. ellipsoidalis Becker and Frye, 1929; (M) 23.4 × 15.9.
Hosts.—Bos frontalis; Bos taurus; Bibos indicus; Bison bonasus. Artiodactyla.
E. environ Honess, 1939; (M) 26.76 × 20.51.
Host.—Sylvilagus nuttallii grangeri. Rodentia.
E. ? epidermica Léger and Duboseq, 1917.
Host.—Glossobalanus minutus. Hemichordata.
E. ? escomeli Rastegaïeff, 1930; (M) 18.9.
Host.—Myrmecophaga trigaetyla. Edentata.
E. eubeckeri Hall and Knipling, 1935; (M) 33.7 × 23.8.
Hosts.—Citellus franklinii; Sciurus vulgaris. Rodentia.

E. exigua Yakimoff, 1934b; (M) 14.5 × 12.75.
Hosts.—Lepus arcticus groenlandicus; Lepus cuniculus; Sylvilagus floridanus mearnsi. Rodentia.
E. falciformis (Eimer, 1870) Schneider, 1875; (M) 26 × 16.
Synonyms.—Gregarina falciformis Eimer, 1870; *Coccidium falciforme* (Eimer, 1870) Schuberg, 1892; *Gregarina muris* Rivolta, 1878; *Pfeifferia schubergi* Labbé, 1896; *Pfeifferella schubergi* (Labbé, 1896) Labbé, 1899; *Eimeria schubergi* (Labbé, 1896) Doflein, 1916; non *Eimeria schubergi* (Schaudinn, 1900).
Host.—Mus musculus. Rodentia.
E. falciformis var. *criceti* Nöller, 1920; (R) 11–12 (–22).
Host.—Cricetus cricetus. Rodentia.
E. faurei (Moussu and Marotel, 1902) Martin, 1909; (R) 30–40 × 18–27.
Synonyms.—Coccidium sp. Moussu and Marotel, 1901; *Coccidium faurei* Moussu and Marotel, 1902; *? Coccidium caprae* Jaeger, 1921; *? Coccidium ovis* Jaeger, 1921.
Hosts.—Capella rupicapra; Capra ibex; Capra sibirica; Ovis aries; Ovis canadensis canadensis; Ovis musimon; Ovis polii polii; Ovis polii sewerzowi; Ovis tragelaphus; Ovis vignei or *O. arkhar.* Artiodactyla.
E. fausti Yakimoff and Matschoulsky, 1936; (R) 22–24 × 12–14.
Host.—Macropus giganteus. Marsupialia.
E. felina Nieschulz, 1924; (M) 24 × 14.5.
Hosts.—Felis domestica; Felis leo. Carnivora.
E. flaviviridis Setna and Bana, 1935a; (R) 25–34 × 11–14.
Synonym.—Eimeria sp. Setna, 1933.
Host.—Hemidactylus flaviviridis. Sauria.
E. franchini Brunelli, 1935; (M) 17.5 × 9.75.
Host.—Sciurus vulgaris. Rodentia.
E. franklinii Hall and Knipling, 1935; (M) 20.6 × 15.2.
Hosts.—Citellus franklinii; Sciurus vulgaris. Rodentia.
E. furonis Hoare, 1927; (M) 12.8 × 12.
Host.—Mustela putorius var. *furo.* Carnivora.
E. gadi Fiebiger, 1913; (R) 26–28.
Hosts.—Gadus aeglifinus; Gadus morrhua; Gadus virens. Pisces.
E. galli-valerioi Rastegaïeff, 1930; (R) 16.2–22.7 × 10.8–14.4.
Synonyms.—Eimeria galli-valeriano Rastegaïeff, 1930, lapsus; *Eimeria galli-valerici* Rastegaïeff, 1930, lapsus.
Hosts.—Cervus elaphus; Dama dama. Artiodactyla.
E. gambai Carini, 1938b; (R) 23–28 × 18–22.
Host.—Didelphys aurita. Marsupialia.
E. gasterostei (Thelohan, 1890) Doflein, 1909; (R) 16–18.
Synonym.—Coccidium gasterostei Thelohan, 1890.
Hosts.—Gasterosteus aculeatus; Gasterosteus clupeatus. Pisces.
E. gekkonis Tanabe, 1928; (R) 17–20 × 13–15.
Host.—Gekko japonicus. Sauria.
E. geomydis Skidmore, 1929; (M) 13.3 × 12.5.
Host.—Geomys bursarius. Rodentia.
E. gigantea (Labbé, 1896) Reichenow, 1921; (M) 70 × 40.
Synonyms.—Pfeifferia sp. Labbé, 1894b; *Pfeifferia gigantea* Labbé, 1896; *Coccidium giganteum* Labbé, 1896; *Pfeifferella gigantea* (Labbé, 1896) Labbé, 1899.
Host.—Lamna cornubica. Elasmobranchii.
E. glaucomydis Roudabush, 1937c; (M) 16.15 × 11.51.
Host.—Glaucomys volens. Rodentia.
E. gobii Fantham, 1932; (R) 16.8–20 × 12.8–16.
Host.—Gobius nudiceps. Pisces.
E. goussevi Yakimoff, 1935b; (M) 21.9 × 15.7.
Host.—Talpa europea. Insectivora.
E. granulosa Christensen, 1938b; (R) 22–35 × 17–25.
Host.—Ovis aries. Artiodactyla.
E. grobbeni Rudovsky, 1925; (R) 9–10 × 10–11.
Host.—Salamandra atra. Caudata.
E. gruis Yakimoff and Matschoulsky, 1935b.
Host.—Anthropoides (= *Grus*) *virgo.* Aves.
E. gupti Bhatia, 1938; (M) 36 × 18.
Synonym.—Eimeria cylindrica Ray and Das Gupta, 1936; non *Eimeria cylindrica* Wilson, 1931.
Host.—Natrix piscator. Serpentes.

E. haberfeldi Carini, 1937c; (M) 30 × 20.
Host.—Caluromys philander. Marsupialia.
E. hagani Levine, 1938; (M) 19.1 × 17.6.
Host.—Gallus domesticus. Aves.
E. hagenmülleri (Léger, 1898) Levine and Becker, 1933; (M) 17.26 × 13.91.
Synonym.—Coccidium hagenmülleri Léger, 1898.
Host.—Stigmatogaster gracilis. Diplopoda.
E. halli ? Yakimoff, 1935a; (M) oval 24 × 17.2; (R) subspherical 14–17; (R) spherical 18–19.8.
Host.—Rattus norvegicus. Rodentia.
E. harpodoni Setna and Bana, 1935b; (M) 14.
Synonym.—Eimeria sp. Setna, 1933.
Host.—Harpodon nehereus. Pisces.
E. ? hartmanni Rastegaïeff, 1930; (M) 22.75 × 14.4.
Host.—Felis tigris. Carnivora.
E. hasei Yakimoff and Gousseff, 1936b; (M) round 16.06; (R) oval 15.86–19.64 × 12.2–17.08.
Host.—Rattus rattus rattus. Rodentia.
E. hegneri Rastegaïeff, 1930; (R) 16.2–18 × 10.8–14.4.
Host.—Cervus canadensis. Artiodactyla.
E. hemidactyli Knowles and Das Gupta, 1935; (M) 18.40 × 15.1.
Host.—Hemidactylus flaviviridis. Sauria.
E. hessei Lavier, 1924; (R) 16–22.
Host.—Rhinolophus hipposideros. Chiroptera.
E. hindlei Yakimoff and Gousseff, 1938b; (M) 24.4 × 19.52.
Host.—Mus musculus. Rodentia.
E. ? hirsuta Schneider, 1887a; (M) 25.
Host.—Gyrinus natator. Insecta.
E. ? hyalina (Léger, 1898) Reichenow, 1921; (M) 17.
Synonym.—Coccidium hyalinum Léger, 1898.
Host.—"Coleoptera."
E. hydrochoeri Carini, 1937b; (R) 20–22 × 16–18.
Host.—Hydrochoerus capibari. Rodentia.
E. ictidea Hoare, 1927; (M) 23.6 × 17.5.
Host.—Mustela putorius var. *furo.* Carnivora.
E. ildefonsoi Torres and Ramos, 1939; (M) 27.68 × 41.56.
Host.—Bos taurus. Artiodactyla.
E. intricata Spiegl, 1925; (M) 45.6 × 33.
Hosts.—Capra hircus; Ovis aries; Ovis aries oasica; Ovis aries steatopyga var. *somalica; Ovis aries strepsiceros* var. *hortob; Ovis canadensis canadensis; Ovis musimon.* Artiodactyla.
E. irara Carini and Fonseca, 1938; (R) 21–25 × 18–20.
Host.—Tayra barbara. Carnivora.
E. irresidua Kessel and Jankiewicz, 1931; (M) 38.3 × 25.6.
Hosts.—"California rabbit"; *Lepus cuniculus; Sylvilagus floridanus mearnsi.* Rodentia.
E. jaboti Carini, 1942.
Host.—Testudo tabulata. Testudinata.
E. jaegeri Carini, 1933b; (R) 16–18.
Host.—Liophis jaegeri. Serpentes.
E. johnsoni ? Yakimoff and Rastegaïeff, 1931; (M) 21.89 × 17.80.
Host.—Gallus domestica. Aves.
E. joyeuxi Yakimoff and Gousseff, 1936e; (M) 26.4 × 21.4.
Host.—Alactaga jaculus. Rodentia.
E. keilini Yakimoff and Gousseff, 1938b; (M) 28.85 × 19.38.
Host.—Mus musculus. Rodentia.
E. kermoganti (Simond, 1901a) Braun, 1908; (R) 20–22.
Synonym.—Coccidium kermoganti Simond, 1901a.
Host.—Gavialis gangeticus. Loricata.
E. knowlesii Bhatia, 1936; (R) 16–20 × 14–18.
Host.—Hemidactylus flaviviridis. Sauria.
E. kofoidi Yakimoff and Matikaschwili, 1936; (M) 20 × 17.6.
Hosts.—Caccabis chucar; Perdix perdix. Aves.
E. koormae Das Gupta, 1938b; (M) 14.
Synonym.—Eimeria boormae Das Gupta, 1938b, lapsus.
Host.—Lissemys punctata. Testudinata.
E. krijgsmanni Yakimoff and Gousseff, 1938b; (M) 21.9 × 14.8.
Host.—Mus musculus. Rodentia.

E. labbeana Pinto, 1928c; (R) 16–18.
Synonyms.—Coccidium pfeifferi Labbé, 1896; *Eimeria pfeifferi* (Labbé, 1896) Wasielewski, 1904; non *Eimeria pfeifferi* (Labbé, 1896) from *Geophilus ferruginosus.*
Hosts.—Columba livia; Columba domestica; Streptopelia orientalis mecna. Aves.
E. labbei nom. nov.
Synonyms.—Pfeifferia sp. Labbé, 1894b; *Pfeifferia tritonis* Labbé, 1896; *Pfeifferella tritonis* (Labbé, 1896) Labbé, 1899; *Eimeria tritonis* (Labbé, 1896) Levine and Becker, 1933; non *Eimeria tritonis* (Steinhaus, 1891).
Host.—Triton cristatus. Caudata.
E. lacazei (Labbé, 1895) Moroff, 1908; (R) 35–40 × 30–35.
Synonym.—Bananella lacazei Labbé, 1895.
Host.—Lithobius forficatus. Chilopoda.
E. lagopodi Galli-Valerio, 1929; (M) 24 × 15.
Host.—Lagopus mutus. Aves.
E. laminata Ray, 1935; (R) 8–11.
Host.—Bufo melanostictus. Salientia.
E. langeroni Yakimoff and Matschoulsky, 1937b; (M) 32.5 × 18.4.
Hosts.—Phasianus colchicus chrysomelas; Phasianus gordius tschardynensis. Aves.
E. lavieri Yakimoff and Gousseff, 1936e; (M) 17.4.
Host.—Alactaga jaculus. Rodentia.
E. legeri (Simond, 1901b) Reichenow, 1921; (R) 16–18.
Synonym.—Coccidium legeri Simond, 1901b.
Host.—Emyda granosa. Testudinata.
E. leporis Nieschulz, 1923; (M) 32 × 16.
Hosts.—Lepus europaeus; Lepus timidus; Lepus tolai; Sylvilagus floridanus mearnsi. Rodentia.
E. leptodactyli Carini, 1931a; (M) 23 × 17.
Host.—Leptodactylus ocellatus. Salientia.
E. longispora Rudovsky, 1922.
Hosts.—Capra hircus; Ovis aries. Artiodactyla.
E. lucida (Labbé, 1893b) Reichenow, 1921; (R) 10–11.
Synonyms.—Coccidium lucidum Labbé, 1893b; *Goussia lucida* (Labbé, 1893b) Labbé, 1896.
Hosts.—Acanthias acanthias; Acanthias vulgaris; Mustelus canis; Mustelus vulgaris; Scyllium catulus; Scyllium stellare. Elasmobranchii.
E. lyruri Galli-Valerio, 1927; (R) 24–27 × 15.
Hosts.—Dryobates major; Lyrurus tetrix; Perdix ruber; Tetrao urogallus aquitanicus. Aves.
E. maboia Carini, 1938a; (M) 20 × 17.
Host.—Mabuia maboia. Sauria.
E. macieli Yakimoff and Matschoulsky, 1938b; (M) 29.7 × 21.2.
Host.—Cobus ellipsiprymnus. Artiodactyla.
E. macropodis Wenyon and Scott, 1925; (R) 22–34 × 10–17.
Host.—Macropus bennetti. Marsupialia.
E. magna Perard, 1925b; (M) 35 × 24.
Synonym.—Eimeria perforans var. *magna* Perard, 1925a.
Hosts.—Lepus californicus; Lepus cuniculus; Lepus cuniculus angoriensis; Lepus europaeus; Sylvilagus floridanus mearnsi. Rodentia.
E. magna var. *robertsoni* Madsen, 1938; (M) 42.1 × 25.82.
Host.—Lepus arcticus groenlandicus. Rodentia.
E. magna var. *robertsoni* nov. var. forma *semisculpta* Madsen, 1938.
Host.—Lepus arcticus groenlandicus. Rodentia.
E. maior Honess, 1939; (M) 46.52 × 30.91.
Host.—Sylvilagus nuttallii grangeri. Rodentia.
E. marmotae Galli-Valerio, 1924; (M) 51 × 42.
Host.—Arctomys marmota. Rodentia.
E. marsupialium Yakimoff and Matschoulsky, 1936; (M) 22.2 × 18.
Host.—Macropus giganteus. Marsupialia.
E. maxima Tyzzer, 1929; (M) 29.3 × 22.6.
Hosts.—Gallus domesticus; Lophortyx californica vallicola. Aves.
E. mayeri Yakimoff, Sokoloff and Matschoulsky, 1936; (M) 17.4 × 15.3.
Host.—Rangifer tarandus. Artiodactyla.
E. mazzai Yakimoff and Gousseff, 1934; (R) 16–18.
Host.—"Frog." Salientia.

E. media Kessel, 1929; (M) 31.2 × 18.5.
Host.—Lepus californicus; Lepus cuniculus; Sylvilagus floridanus mearnsi; Sylvilagus nuttallii grangeri. Rodentia.
E. media var. Honess, 1939; (M) 28.24 × 19.61.
Host.—Sylvilagus nuttalii grangeri. Rodentia.
E. megalostomata Ormsbee, 1939; (M) 24 × 19.
Host.—Phasianus colchicus torquatus. Aves.
E. meleagridis Tyzzer, 1927; (M) 23.79 × 17.33.
Hosts.—Meleagris gallopago; Meleagris mexicana. Aves.
E. meleagrimitis Tyzzer, 1929; (M) 18.12 × 15.28.
Hosts.—Meleagris gallopago; Meleagris mexicana. Aves.
E. melis Kotlan and Pospesch, 1933; (M) 19 × 21.
Host.—Meles taxus. Carnivora.
E. mephitidis Andrews, 1928; (M) 20.68 × 19.24.
Hosts.—Mephitis hudsonica; Mephitis mephitica. Carnivora.
E. meservei Coatney, 1935; (M) 17.74 × 16.76.
Host.—Sterna forsteri. Aves.
E. mesnili Rastegaïeff, 1929; (R) 18 × 10.8–16.2.
Host.—Canis lagopus. Carnivora.
E. metchnikovi (Laveran, 1897) Reichenow, 1921; (R) 20–25.
Synonym.—Coccidium metchnikovi Laveran, 1897.
Hosts.—Gobio fluviatilis; Gobio gobio. Pisces.
E. mikanii Carini, 1933b; (R) 26–29 × 18–20.
Host.—Sybinomorphus mikanii. Serpentes.
E. minuta (Thelohan, 1892) Doflein, 1909; (R) 9–10.
Synonyms.—Coccidium minutum Thelohan, 1892; *Goussia minuta* (Thelohan, 1892) Labbé, 1896.
Hosts.—Tinca fluviatilis; Tinca tinca; Tinca vulgaris. Pisces.
E. mirabilis Yakimoff, 1936c; (M) 32.8 × 19.
Host.—Ophisaurus apodus. Sauria.
E. misgurni Stankovitch, 1924a; (R) 11–12 × 5.3.
Hosts.—Cobitis taenia; Misgurnus fossilis. Pisces.
E. mitis Tyzzer, 1929; (M) 16.2 × 15.5.
Hosts.—Gallus domesticus; Lophortyx californica vallicola; Oreortyx picta plumifera. Aves.
E. mitraria (Laveran and Mesnil, 1902b) Doflein, 1909; (M) 10 × 15.
Synonym.—Coccidium mitrarium Laveran and Mesnil, 1902b.
Hosts.—Chrysemys marginata bellii; Damonia reevesii. Testudinata.
E. miyairii Ohira, 1912; (M) 24.38 × 22.12.
Synonym.—Eimeria carinii Pinto, 1928b.
Hosts.—Rattus norvegicus; Rattus rattus rattus. Rodentia.
E. monacis Fish, 1930; (M) 19.97 × 18.26.
Synonym.—Eimeria dura Crouch and Becker, 1931.
Hosts.—Marmota bobak; Marmota monax monax. Rodentia.
E. motellae (Labbé, 1893b) Yakimoff, 1929b; (R) 13–14.
Synonyms.—Coccidium motella Labbé, 1893b; *Goussia motellae* (Labbé, 1893b) Labbé, 1896.
Host.—Motella tricirrata. Pisces.
E. mühlensi Yakimoff, Sokoloff and Matschoulsky, 1936; (M) 36 × 27.4.
Host.—Rangifer tarandus. Artiodactyla.
E. muris Galli-Valerio, 1932; (M) 21 × 15.
Host.—Mus sylvaticus. Rodentia.
E. musculi Yakimoff and Gousseff, 1938b; (M) 20.74 × 25.60.
Host.—Mus musculus. Rodentia.
E. mustelae Iwanoff-Gobzem, 1934b; (M) 21.6 × 18.9.
Host.—Mustela nivalis. Carnivora.
E. mutum Grecchi, 1939; (M) 24 × 22.
Host.—Crax fasciolata. Aves.
E. myopotami Yakimoff, 1933a; (R) round 21–23; (R) almost round 21–25 × 19.8–23.4; (R) oval 21–27 × 18–23.9.
Host.—Myopotamus caipus. Rodentia.
E. myoxi Galli-Valerio, 1940; (M) 18 × 15.
Host.—Myoxus quercinus. Rodentia.
E. nadsoni Yakimoff and Gousseff, 1936a; (M) spherical 22.13; (M) subspherical 24.9 × 21.34.
Host.—Lyrurus tetrix. Aves.
E. najae Ray and Das Gupta, 1937; (R) 23–27 × 16–18.
Host.—Naja naja. Serpentes.

E. nana Yakimoff, 1933c. From *Capra sibirica;* (M) round 15.7; (R) oval 16.5–18 × 15–16.3. From *Ovis musimon;* (R) round 15–18; (R) oval 15–18 × 9.5–16.
Hosts.—Capra sibirica; Ovis musimon. Artiodactyla.
E. nasuae Carini and Grechi, 1938; (R) 16–19 × 15–17.
Host.—Nasua nasica. Carnivora.
E. naye Galli-Valerio, 1940; (R) 18–21 × 12–13.5.
Host.—Mus sylvaticus. Rodentia.
E. necatrix Johnson, 1930; (M) 16.7 × 14.2.
Host.—Gallus domesticus. Aves.
E. neglecta Nöller, 1920; (R) 9–10.
Hosts.—Rana esculenta; Rana temporaria. Salientia.
E. neoleporis Carvalho, 1942; (M) 38.8 × 19.8.
Hosts.—Lepus cuniculus; Sylvilagus floridanus mearnsi. Rodentia.
E. neotomae Henry, 1932b; (M) 22.4 × 16.
Host.—Neotoma fuscipes. Rodentia.
E. nicollei Yakimoff and Gousseff, 1935b; (M) 26.72 × 16.63.
Host.—Carassius carassius. Pisces.
E. nieschulzi Dieben, 1924; (M) 22.5 × 17.8.
Synonym.—"Eimeria miyairii Ohira, 1912" Becker, 1934.
Hosts.—Rattus norvegicus; Rattus rattus rattus. Rodentia.
E. ninae-kohl-yakimovae Yakimoff and Rastegaïeff, 1930; (M) round 20.7; (M) oval 23 × 16.1.
Synonym.—Eimeria ninae kohl-yakimovi Yakimoff and Rastegaïeff, 1930.
Hosts.—Capra hircus; Capra sibirica; Gazella subgutturosa; Ovis aries; Ovis canadensis canadensis; Ovis musimon; Ovis nivicola; Ovis ophion armeniana; Ovis tragelaphus; Ovis vignei or *Ovis arkhar; Ovis orientalis.* Artiodactyla.
E. nishin Fujita, 1934; (R) 45–50.
Host.—"Herring." Pisces.
E. nocens Kotlan, 1933; (R) 25–33 × 17–24.
Host.—Anser anser anser. Aves.
E. nochti Yakimoff and Gousseff, 1936b; (M) 17.17 × 14.20.
Host.—Rattus rattus rattus. Rodentia.
E. ? nölleri Rastegaïeff, 1930; (M) 18.9.
Host.—Coelogenus paka. Artiodactyla.
E. novo-wenyoni Rastegaïeff, 1929; (R) 14.4 × 18.
Host.—Felis tigris. Carnivora.
E. nuttalli Yakimoff and Matikaschwili, 1933a; (M) 19.5 × 14.
Host.—Procyon lotor. Carnivora.
E. ondatrae-zibethicae Martin, 1930; (M) 22.33 × 17.97.
Host.—Ondatra zibethica. Rodentia.
E. ondinae Carini, 1939b; (R) 20–22.
Host.—Drymobius bifossatus. Serpentes.
E. oryzomysi Carini, 1937a; (R) 22–25 × 17.19.
Host.—Oryzomys sp. Rodentia.
E. os Crouch and Becker, 1931; (R) 20–26 × 18–22.
Host.—Marmota monax monax. Rodentia.
E. ostertagi Yakimoff and Gousseff, 1936d; (M) 33.07 × 26.50.
Host.—Erinaceous europaeus. Insectivora.
E. pacifica Ormsbee, 1939; (M) 22 × 18.
Host.—Phasianus colchicus torquatus. Aves.
E. pallida Christensen, 1938; (R) 12–20 × 8–15.
Host.—Ovis aries. Artiodactyla.
E. paludosa (Léger and Hesse, 1922) Hoare, 1933; (R) 14–15 × 11.
Synonym.—Jarrina paludosa Léger and Hesse, 1922.
Hosts.—Fulica americana; Fulica atra atra; Gallinula chloropus chloropus. Aves.
E. paraensis Carini, 1935; (R) 33–40 × 30–35.
Host.—Cotia vermelha. Rodentia.
E. parva Kotlan, Moesy and Vajda, 1929; (R) 11.4–14.3 × 9.5–11.8.
Synonym.—Eimeria galouzoi Yakimoff and Rastegaïeff, 1930.
Hosts.—Capra hircus; Capra sibirica; Ovis aries; Ovis canadensis canadensis; Ovis nivicola; Ovis tragelaphus. Artiodactyla.
E. parvula Kotlan, 1933; (R) 10–15 × 10–14.
Synonym.—Eimeria anseris Kotlan, 1932, pro parte.
Host.—Anser anser anser. Aves.

E. paulistana da Fonseca, 1933b; (R) 40–43 × 23.5.
Hosts.—Sylvilagus floridanus mearnsi; Sylvilagus minensis. Rodentia.
E. pellucida Yakimoff, 1933a; (R) 30–39.6 × 19.8–23.4.
Host.—Myopotamus caipus. Rodentia.
E. perardi Yakimoff and Gousseff, 1936d; (M) 20.01 × 14.96.
Host.—Erinaceus europaeus. Rodentia.
E. percae (Dujarric de la Riviere, 1914) Reichenow, 1921.
Synonym.—Coccidium percae Dujarric de la Riviere, 1914.
Host.—Perca fluviatilis. Pisces.
E. perforans (Leuckart, 1879) Sluiter and Swellengrebel, 1912; (M) 25.5 × 15.5.
Synonym.—Coccidium perforans Leuckart, 1879.
Hosts.—Lepus americanus; Lepus californicus; Lepus cuniculus; Lepus europaeus; Sylvilagus floridanus mearnsi. Rodentia.
E. perforans var. *groenlandica* Madsen, 1938; (M) 32.55 × 22.26.
Host.—Lepus arcticus groenlandica. Rodentia.
E. perforans var. *stiedae* Doria, 1933; (R) 25–36 × 21.
Host.—"Coniglio" (rabbit). Rodentia.
E. perforoides Crouch and Becker, 1931; (R) 17–24 × 15–20.
Host.—Marmota monax monax. Rodentia.
E. ? perichaetae (Beddard, 1888) Levine and Becker, 1933.
Synonym.—Coccidium perichaetae Beddard, 1888.
Hosts.—Perichaeta armata; Perichaeta novae-zelandiae. Annelida.
E. perminuta Henry, 1931a; (R) 11.2–16 × 9.6–12.8.
Synonym.—Eimeria permunita Henry, 1931a, lapsus.
Host.—Sus scrofa domestica. Artiodactyla.
E. persica (Phisalix, 1925) Levine and Becker, 1933; (M) 31.5 × 18.9.
Synonym.—Coccidium persicum Phisalix, 1925.
Host.—Tropidonotus natrix var. *persa.* Serpentes.
E. peruviana Yakimoff, 1934c; (M) 31.8 × 19.3.
Host.—Llama glama. Artiodactyla.
E. pfeifferi Labbé, 1896.
Host.—Geophilus ferruginosus. Chilopoda.
E. phasiana Tyzzer, 1929; (M) 23.04 × 15.89.
Hosts.—Phasianus colchicus colchicus; Phasianus colchicus torquatus. Aves.
E. pigra Léger and Bory, 1932; (R) 17–19 × 14.
Host.—Scardinius erythrothalmus. Pisces.
E. pintoensis da Fonseca, 1933a; (R) 23–26.5 × 15–16.
Host.—Sylvilagus minensis. Rodentia.
E. pintoi Carini, 1931b; (R) 30–33 × 20–22.
Hosts.—"Alligator"; *Crocodilus* sp. Loricata.
E. piraudi Gauthier, 1921; (R) 11–13.
Host.—Cottus gobio. Pisces.
E. piriformis Kotlan and Pospesch, 1934; (M) 29 × 18.
Hosts.—Lepus cuniculus; Sciurus vulgaris. Rodentia.
E. piscatori Ray and Das Gupta, 1936; (R) 29–31 × 22.5–24.5.
Host.—Natrix piscator. Serpentes.
E. poecilogyri Carini, 1933b; (R) 15–16.
Synonym.—Eimeria poecilogyri Carini, 1933b, lapsus.
Host.—Leimadophis poecilogyrus. Serpentes.
E. polaris Yakimoff and Sokoloff, 1935; (M) 27.8 × 17.1.
Host.—Rangifer tarandus. Artiodactyla.
E. polycephali Yakimoff and Matschoulsky, 1939a; (M) 17.26 × 13.91.
Host.—Porphrio s. Polycephalus caeruleus. Aves.
E. praecox Johnson, 1930; (M) 21.25 × 17.07.
Host.—Gallus domesticus. Aves.
E. prevoti (Laveran and Mesnil, 1902a) Doflein, 1909; (R) usual form 20–22 × 12–15; (M) subspherical form 18 × 16.
Synonyms.—Paracoccidium prevoti Laveran and Mesnil, 1902a; *Eimeria prevunti* Laveran and Mesnil, 1902a, lapsus.
Host.—Rana esculenta. Salientia.
E. procera Haase, 1939; (R) 28.8–31.2 × 16.4–17.2.
Hosts.—Perdix perdix; Tetrao urogallus. Aves.
E. propria (Schneider, 1881) Doflein, 1909; (R) 36–43 × 20–27.
Synonyms.—Orthospora propria Schneider, 1881; *Coccidium proprium* (Schneider, 1881) Schneider, 1887b.
Hosts.—Triton alpestris; Triton cristatus; Triton palmatus; Triton punctatus; Triton pyrrhogaster; Triton taeniatus; Triton vulgaris. Caudata.

E. pythonis Triffitt, 1925; (M) 27.5 × 17.
Hosts.—Python molurus; Python sebae. Serpentes.
E. raiarum van den Berghe, 1937; (M) 22 × 20.
Host.—Raia batis. Elasmobranchii.
E. raillieti (Léger, 1899) Galli-Valerio, 1930; (M) 18.
Synonym.—Coccidium raillieti Léger, 1899.
Host.—Anguis fragilis. Sauria.
E. ranae (Dobell, 1908) Dobell, 1909; (R) 18–22.
Synonym.—Coccidium ranae Dobell, 1908.
Hosts.—Rana esculenta; Rana temporaria. Salientia.
E. ranarum (Labbé, 1894a) Doflein, 1909; (M) 17 × 12.
Synonyms.—Karyophagus ranarum Labbé, 1894a; *Coccidium ranarum* (Labbé, 1894a) Laveran and Mesnil, 1902a; *Acystis parasitica* Labbé, 1894a, pro parte.
Hosts.—Rana esculenta; Rana temporaria. Salientia.
E. ratti Yakimoff and Gousseff, 1936b; (M) 22.79 × 14.71.
Host.—Rattus rattus rattus. Rodentia.
E. reichenovi Yakimoff and Matschoulsky, 1935b; (M) 18.5 × 13.6.
Host.—Anthropoides (= Grus) virgo. Aves.
E. residua Henry, 1932b; (M) 25.6 × 22.4.
Host.—Neotoma fuscipes. Rodentia.
E. rhynchoti Reis and Nohrega, 1936.
Host.—Rhynchotus rufescens. Aves.
E. riedmülleri Yakimoff and Matschoulsky, 1940; (M) 19.6 × 16.8.
Host.—Capella rupicapra. Artiodactyla.
E. rivieri Yakimoff, 1929b; (R) round 14–16.8; (R) oval 11.55–15.5 × 7–13.3.
Host.—Perca fluviatilis. Pisces.
E. rocha-limai Carini and Pinto, 1926b.
Hosts.—Hemidactylus mabuia; Ameiva ameiva. Sauria.
E. roscoviensis (Labbé, 1893d) Wasielewski, 1904; (R) 16–18 × 14–16.
Synonym.—Coccidium roscoviense Labbé, 1893d.
Hosts.—Actitis hypoleucos; Calidris arenaria; Charadrius alexandrinus; Charadrius cantianus; Charadrius dubius; Charadrius philippinus; Motacilla alba; Numenius phaeopus; Pelidna torquata; Phalacrocorax aristotelis; Pluvialis apricarius; Strepsilas interpres; Totanus calidris; Totanus hypoleucos; Totanus totanus; Tringa alpina. Aves.
E. rouxi (Elmassian, 1909) Reichenow, 1921; (M) 10.
Synonym.—Coccidium rouxi Elmassian, 1909.
Hosts.—Tinca tinca; Tinca vulgaris. Pisces.
E. rupicaprae Galli-Valerio, 1924; (M) 21 × 16.5.
Host.—Capella rupicapra. Artiodactyla.
E. salamandrae (Steinhaus, 1889) Dobell, 1909.
Synonyms.—Karyophagus salamandrae Steinhaus, 1889; *Cytophagus tritonis* Steinhaus, 1891; *Acystis parasitica* Labbé, 1894a, pro parte; *Karyophagus tritonis* (Steinhaus, 1891) Wasielewski, 1896; *Coccidium salamandrae* (Steinhaus, 1889) Simond, 1897; *Eimeria tritonis* (Steinhaus, 1891) Walton, 1941.
Host.—Salamandra maculosa. Caudata.
E. salamandrae-atrae (Phisalix, 1927) Levine and Becker, 1933; (M) 27.5 × 23.
Synonym.—Coccidium salamandrae-atrae Phisalix, 1927.
Host.—Salamandra atra. Caudata.
E. sardinae (Thelohan, 1890) Reichenow, 1921; (M) 50.
Synonyms.—Coccidium sardinae Thelohan, 1890; *Eimeria oxyphila* Dobell, 1919, lapsus; *Eimeria oxyspora* Dobell, 1919; *Eimeria snijdersi* Dobell, 1920.
Hosts.—Clupea pilchardus; "Herring"; "Mackerel." Pisces.
E. scabra Henry, 1931a; (R) 22.4–35.6 × 16–25.6.
Synonym.—Eimeria scarba Henry, 1931a, lapsus.
Hosts.—Sus scrofa domestica; Sus scrofa ferus. Artiodactyla.
E. scapani Henry, 1932b; (R) 16–22.4 × 14.4–16.
Hosts.—Scapanus latimanus; Mogera wogura coreana. Insectivora.
E. schaudinniana Pinto, 1928c.
Synonyms.—Coccidium schubergi Schaudinn, 1900; *Eimeria schubergi* (Schaudinn, 1900) Wasielewski, 1904; non *Eimeria schubergi* (Labbé, 1896).
Host.—Lithobius forficatus. Chilopoda.
E. schüffneri Yakimoff and Gousseff, 1938b; (R) 18.3–24.26 × 14.64–15.5.
Host.—Mus musculus. Rodentia.

E. scinci (Phisalix, 1923) Levine and Becker, 1933; (R) 31–35 × 18–20.
Synonyms.—Coccidium scinci Phisalix, 1923; *Eimeria sinci* (Phisalix, 1923), lapsus.
Hosts.—Scincus officinalis; Hemidactylus flaviviridis. Sauria.
E. sciurorum Galli-Valerio, 1922; (M) 24 × 15.
Synonym.—Eimeria sciuri Galli-Valerio, 1922, lapsus.
Hosts.—Glaucomys volens; Neosciurus carolinensis; Sciurus niger rufiventer; Sciurus vulgaris; Sciurus vulgaris var. *alpina; Sciurus vulgaris* var. *noire.* Rodentia.
E. scrofae Galli-Valerio, 1935; (M) 24 × 15.
Host.—Sus scrofa domestica. Artiodactyla.
E. sculpta Madsen, 1938; (M) 36.84 × 28.75.
Host.—Lepus arcticus groenlandicus. Rodentia.
E. scylii (Drago, 1902) Levine and Becker, 1933.
Synonym.—Coccidium scylii Drago, 1902.
Host.—Scyllium sp. Elasmobranchii.
E. separata Becker and Hall, 1931; (M) 16.06 × 13.85.
Host.—Rattus norvegicus. Rodentia.
E. septentrionalis Yakimoff, Matschoulsky and Spartansky, 1936; (M) 26.7 × 21.6.
Host.—Lepus timidus. Rodentia.
E. sibirica Yakimoff and Terwinsky, 1931; (R) 21.25–27.62 × 17–21.25.
Host.—Martes zibelina. Carnivora.
E. simondi (Léger, 1898) Levine and Becker, 1933.
Synonym.—Coccidium simondi Léger, 1898.
Host.—Himantarium gabrielis. Chilopoda.
E. solipedum Gousseff, 1934; (R) 15.5–28.
Hosts.—"Donkey"; Equus caballus; "Mule"; Perissodactyla.
E. soricinae Galli-Valerio, 1927; (M) 50 × 30.
Host.—Sorex araneus. Insectivora.
E. soricis Henry, 1932b; (R) 19.2–22.4 × 12.8–14.4.
Hosts.—Sorex araneus; Sorex californicus. Insectivora.
E. soufiae Stankovitch, 1921; (R) 17–18.
Synonym.—Eimeria soufiae Stankovitch, 1921, lapsus.
Host.—Squalius agassizi. Pisces.
E. southwelli Halawani, 1930; (R) 25–50.
Host.—Aëtobatis narinari. Elasmobranchii.
E. speotytoi Carini, 1939a; (R) 32–34 × 24–26.
Host.—Speotyto cunicularia grallaria. Aves.
E. spherica (Schneider, 1887b) Levine and Becker, 1933; (M) 22–38.
Synonym.—Coccidium sphericum Schneider, 1887b.
Hosts.—Triton alpestris; Triton cristatus; Triton palmatus; Triton punctatus; Triton pyrrhogaster. Caudata.
E. spinosa Henry, 1931a; (R) 16–22.4 × 12.8–16.
Host.—Sus scrofa domestica. Artiodactyla.
E. sprehni Yakimoff, 1934a; (M) 17.6 × 12.
Hosts.—Castor canadensis canadensis; Castor fiber. Rodentia.
E. stankovitchi Pinto, 1928c; (M) 10.
Synonyms.—Goussia legeri Stankovitch, 1920; *Eimeria legeri* (Stankovitch, 1920) Pinto, 1928c; non *Eimeria legeri* (Simond, 1901b).
Hosts.—Alburnus brama; Alburnus lucidus; Scardinius erythrothalmus; Pisces.
E. stenocerci Carini, 1940b; (R) 24–27 × 19–20.
Synonym.—Eimeria tropidura Carini, 1941a.
Host.—Tropidura torquatus torquatus. Sauria.
E. stercorariae Galli-Valerio, 1940; (M) 12 × 9.
Host.—Stercorarius parasiticus. Aves.
E. stiedae (Lindemann, 1865) Kisskalt and Hartmann, 1907; (R) 28–40 × 16–25.
Synonyms.—Monocystis stiedae Lindemann, 1865; *? Psorospermium cuniculi* Rivolta, 1878; *Coccidium oviforme* Leuckart, 1879; *? Coccidium cuniculi* (Rivolta, 1878) Labbé, 1899; *? Eimeria cuniculi* (Rivolta, 1878) Wasielewski, 1904; *Eimeria oviformis* (Leuckart, 1879) Fantham, 1911.
Hosts.—Lepus americanus; Lepus californicus; Lepus cuniculus; Lepus timidus; Lepus variabilis; Sylvilagus floridanus mallurus; Sylvilagus floridanus mearnsi; Sylvilagus nuttallii grangeri. Rodentia.
E. stiedae var. *cuniculi* Graham, 1933.
Host.—"Rabbit."
E. stolatae Ray and Das Gupta, 1938; (M) 20.5.
Host.—Natrix stolata. Serpentes.

E. subepithelialis Moroff and Fiebiger, 1905; (M) 18–21.
Host.—Cyprinus carpio. Pisces.
E. subspherica Christensen, 1941; (M) 11 × 10.4.
Host.—Bos taurus. Artiodactyla.
E. sylvilagi Carini, 1940a; (R) 26–28 × 15–16.
Host.—Sylvilagus brasiliensis. Rodentia.
E. syngnathi Yakimoff and Gousseff, 1936c; (M) 28.7 × 20.6.
Host.—Syngnathus nigrilineatus. Pisces.
E. tarandina Yakimoff, Sokoloff and Matschoulsky, 1936; (M) round 20; (M) oval 20.1 × 17.7.
Host.—Rangifer tarandus. Artiodactyla.
E. tatusi Carini, 1933a; (R) 30–33.
Hosts.—Cabassus sp.; *Cabassus unicinctus; Chaetophractus villosus.* Edentata.
E. tenella (Railliet and Lucet, 1891) Fantham, 1909; (M) 22.6 × 19.
Synonyms.—Eimeria avium auct.; *Coccidium tenellum* Railliet and Lucet, 1891; *? Coccidium globosum* Labbé, 1893c; *Eimeria bracheti* Gerard, 1913; *? Eimeria globosa* (Labbé, 1893c) Levine and Becker, 1933.
Hosts.—Caccabis saxatalis; Colinus virginianus virginianus; Gallus domesticus; Lagopus scoticus; Lophortyx californica vallicola; Oreortyx picta plumifera; Perdix perdix; Perdix saxatalis; Phasianus colchicus colchicus; Phasianus colchicus torquatus. Aves.
E. tertia Lavier, 1936; (R) 22–33 × 18–25.
Hosts.—Triton alpestris; Triton cristatus. Caudata.
E. tetricis Haase, 1939; (R) 29.8–31.4 × 14.2–15.4.
Host.—Tetrao tetrix. Aves.
E. thelohani (Labbé, 1896) Yakimoff, 1929; (R) 25–30.
Synonyms.—Coccidium ? sp. Thelohan, 1894; *Coccidium thelohani* Labbé, 1896.
Host.—Labrus sp. Pisces.
E. thianethi Gwéléssiany, 1935; (M) 42.6 × 28.6.
Hosts.—Bos taurus; "Buffalo." Artiodactyla.
E. travassosi da Cuhna and Muniz, 1928; (R) 50–52 × 39–40.
Hosts.—Dasypus sexcinctus; Muletia hybrida. Edentata.
E. triffittae Yakimoff, 1934c; (M) 21.1 × 17.8.
Synonym.—Eimeria triffitt Yakimoff, 1934c.
Host.—Orias canna. Artiodactyla.
E. tropidonoti Guyenot, Naville and Ponse, 1922; (R) 22–24 × 12–15.
Host.—Tropidonotus natrix. Serpentes.
E. truncata (Railliet and Lucet, 1891) Wasielewski, 1904; (R) 20–22 × 13–16.
Synonym.—Coccidium truncatum Railliet and Lucet, 1891.
Host.—Anser anser anser. Aves.
E. truttae (Léger and Hesse, 1919) Stankovitch, 1924b; (M) 12.
Synonym.—Goussia truttae Léger and Hesse, 1919.
Host.—Salmo fario. Pisces.
E. tyzzeri ? Yakimoff and Rastegaïeff, 1931; (R) 25–37 × 18–26.
Host.—Gallus domesticus. Aves.
E. uniungulati Gousseff, 1934; (R) 15.5–24 × 12.4–17.
Host.—Equus caballus. Perissodactyla.
E. urnula Hoare, 1933; (R) 17.6–23.2 × 12.8–13.6.
Synonym.—Eimeria cernula Hoare, 1933, lapsus.
Host.—Phalacrocorax carbo lugubris. Aves.
E. ursi Yakimoff and Matschoulsky, 1935a; (R) 12.63–14.74 × 10.52–12.63.
Host.—Ursus aretus. Carnivora.
E. ussuriensis Yakimoff and Springholtz-Schmidt, 1939; (M) round 22.14; (M) subspherical 22.9 × 20.3; (M) ovoid 22.6 × 19.5; (M) oval 23.4 × 20.
Host.—Spermophilus eversmanni. Rodentia.
E. ? utinensis Selan and Vittorio, 1924.
Host.—Equus caballus. Perissodactyla.
E. variabilis (Thelohan, 1893) Reichenow, 1921; (R) 15–20.
Synonyms.—Coccidium variabile Thelohan, 1893; *Goussia variabilis* (Thelohan, 1893) Labbé, 1896.
Hosts.—Anguilla vulgaris; Cottus bubalis; Crenilabrus melops; Gobius bicolor; Gobius paganellus; Lepidogaster gouani. Pisces.
E. ventriosa Haase, 1939; (R) 31.5–33.5 × 20.4–22.9.
Host.—Tetrao urogallus. Aves.
E. viridis (Labbé, 1893c) Reichenow, 1921.
Synonym.—Coccidium viride Labbé, 1893.
Host.—Rhinolophus fer-equinum. Chiroptera.

E. vison Kingscote, 1935; (R) 17–22.1 × 9–18.
Synonym.—Eimeria mustelae Kingscote, 1934; non *Eimeria mustelae* Iwanoff-Gobzem, 1934b.
Hosts.—Mustela putorius var. *furo; Mustela vison.* Carnivora.
E. volgensis Sassuchin and Rauschenbach, 1932; (M) 27.2 × 21.9.
Host.—Citellus pygmaeus. Rodentia.
E. vulpis Galli-Valerio, 1929; (M) 17 × 14.
Hosts.—Canis vulgaris; Canis vulpes. Carnivora.
E. wassilewskyi Rastegaïeff, 1930; (M) 18 × 14.4.
Hosts.—Cervus axis; Cervus elaphus; Pseudaxis dybovsky. Artiodactyla.
E. wierzejski Hofer, 1904; (R) 11–12.
Host.—Cyprinus carpio. Pisces.
E. wyomingensis Huizinga and Winger, 1942; (M) 40.3 × 28.1.
Host.—Bos taurus. Artiodactyla.
E. yakimovi Rastegaïeff, 1930; (R) 32.4–41.4 × 21.6–28.8.
Host.—Boselaphus tragocamelus. Artiodactyla.
E. yakisevi nom. nov.; (M) 19.52 × 24.4.
Synonym.—Eimeria brumpti Yakimoff and Gousseff, 1936a; non *Eimeria brumpti* Cauchemez, 1921.
Hosts.—Dryobates major; Tetrao urogallus. Aves.
E. zamenis Phisalix, 1921; (R) 28–30 × 15–18.
Hosts.—Coluber constrictor; Coluber constrictor flaviventris; Masticophis flagellus flagellus; Zamenis (= *Coluber*) sp. Serpentes.
E. zürnii (Rivolta, 1878) Martin, 1909; (M) 17.8 × 15.6.
Synonyms.—Cytospermium zürnii Rivolta, 1878; *Coccidium zürnii* (Rivolta, 1878) Railliet and Lucet, 1891; *Coccidium bovis* Züblin, 1908, pro parte; *Eimeria bovis* (Züblin, 1908) Fiebiger, 1912a, pro parte; *Eimeria canadensis* Bruce, 1921, pro parte.
Hosts.—Bibos indicus; Bos taurus; "Carabao"; *Cervus canadensis.* Artiodactyla.

SPECIES AND SPECIFIC NAMES NOT RECOGNIZED AS VALID

E. aemula Yakimoff, 1931b. See *E. arloingi.*
E. arvalis. Lapsus for *E. arvicolae* (Galli-Valerio, 1905). In Iwanoff-Gobzem, 1934b.
E. avium auct. See *E. tenella.*
E. belli. Lapsus for *Isospora belli* Wenyon, 1923. In Yakimoff, 1929b.
E. boormae. Lapsus for *E. koormae* Das Gupta, 1938b. In Deeds and Jahn, 1939.
E. brumpti Cauchemez, 1921. See *E. debliecki.*
E. brumpti Yakimoff and Gousseff, 1936a. See *E. yakisevi.*
E. butkai Causey, 1926. From man. Kessel (1933) examined the material from which this species was described and found nothing resembling a coccidium. He feels that it should not be accepted until corroborated.
E. carinii Pinto, 1928b. See *E. miyairii.*
E. cernula. Lapsus for *E. urnula* Hoare, 1933. In Mesnil, 1937.
Ermeria (sic) *commodium* Shaw, 1935, nomen nudum. From *Gallus domesticus.* Aves.
E. cuniculi (Rivolta, 1878). See *E. stiedae.*
E. cylindrica Ray and Das Gupta, 1936. See *E. gupti.*
E. dubia Railliet, 1893. An unrecognizable species from chickens.
E. dura Crouch and Becker, 1931. See *E. monacis.*
E. dutoiti. Lapsus in title for *Isospora dutoiti* Yakimoff, Matikaschwili and Rastegaïeff, 1933.
E. fusca (Olt, 1896) Neveu-Lemaire, 1912. Found in skin of swine. Probably does not belong in this genus.
E. galli-valeriano. Lapsus for *E. galli-valerioi* Rastegaïeff, 1930. In Yakimoff, 1935c.
E. galli-valerici. Lapsus for *E. galli-valerioi* Rastegaïeff, 1930. In Yakimoff, 1935c.
E. galouzoi Yakimoff and Rastegaïeff, 1930. See *E. parva.*
E. gilruthi (Chatton, 1910) Reichenow and Carini, 1937. Probably an asexual stage of one of the species in sheep.
E. globosa (Labbé, 1893c). See *E. tenella.*
E. gubleri (Guiart, 1922) Wenyon, 1926. A questionable species from man.
E. hemmitraga Yakimoff and Matschoulsky, 1938a, nomen nudum. From *Hemmitraga* sp. Artiodactyla.
E. hominis (Rivolta, 1878). [= *Isospora hominis* (Rivolta, 1878) Magath, 1935.]

E. jalina (Perroncito, 1901. [=*Blastocystis jalina* (Perroncito, 1901) Wenyon, 1926.]
E. jalina Krediet, 1921. See *E. debliecki.*
E. katschkari Yakimoff and Matschoulsky, 1938a, nomen nudum. From *Ovis polii.* Artiodactyla.
E. legeri (Stankovitch, 1920). See *E. stankovitchi.*
E. leuckarti (Flesch, 1883) Reichenow, 1940. A questionable species from horses.
E. mccordocki Honess, 1941, nomen nudum. From "Black-tailed deer." Artiodactyla.
E. mustelae Kingscote, 1934. See *E. vison.*
E. nepae Schneider, 1887. [= *Barrouxia nepae* (Schneider, 1887) Wenyon, 1926.]
E. nova Schneider, 1881. [= *Legerella nova* (Schneider, 1881) Mesnil, 1900.]
E. nuda (Marcone, 1908) Levine and Becker, 1933. Found in the skin of a dog. Probably does not belong in this genus.
E. oviformis (Leuckart, 1879). See *E. stiedae.*
E. oxyphila. Lapsus for *E. oxyspora* Dobell, 1919. In Neveu-Lemaire, 1921. See *E. sardinae.*
E. oxyspora Dobell, 1919. See *E. sardinae.*
E. permunita. Lapsus for *E. perminuta* Henry, 1931a. In Yakimoff, 1933b.
E. pfeifferi (Labbé, 1896). See *E. labbeana.*
E. poccilogyri. Lapsus for *E. poecilogyri* Carini, 1933b. In Carini, 1934.
E. prevunti. Lapsus for *E. prevoti* Laveran and Mesnil, 1902a. In Yakimoff and Matikaschwili, 1933b.
E. princeps (Labbé, 1896). An unrecognizable species from rabbits.
E. pylori (Gebhardt, 1897) Levine and Becker, 1933. An egg of *Distomum turgidum,* according to Braun, 1908. From *Rana* sp. Salientia.
E. rivolta (Grassi, 1879). [= *Isospora rivolta* (Grassi, 1879) Dobell, 1919.]
E. scarba. Lapsus for *E. scabra* Henry, 1931a. In Yakimoff and Matikaschwili, 1932c.
E. schneideri Bütschli, 1881. [= *Barrouxia schneideri* (Bütschli, 1881) Labbé, 1899.]
E. schubergi (Labbé, 1896). See *E. falciformis.*
E. schubergi (Schaudinn, 1900). See *E. schaudinniana.*
E. sciuri. Lapsus for *E. sciurorum* Galli-Valerio, 1922. In Yakimoff and Terwinsky, 1931.
E. sinci. Lapsus for *E. scinci* (Phisalix, 1923). In Triffitt, 1925.
E. smithi Yakimoff and Galouzo, 1927. See *E. bovis.*
E. snijdersi Dobell, 1920. See *E. sardinae.*
E. sontlae. Lapsus for *E. soufiae* Stankovitch, 1921. In Yakimoff, 1929a.
E. suis Nöller, 1921. See *E. debliecki.*
E. tritonis (Labbé, 1896). See *E. labbei.*
E. tritonis (Steinhaus, 1891). See *E. salamandrae.*
E. tropidura Carini, 1941a. See *E. stenocerci.*
E. tuis. Lapsus for *E. suis* Nöller, 1921. See *E. debliecki.*
E. votti. Lapsus for *E. cotti* Gauthier, 1921. In Gauthier, 1921.
E. wenyoni Dobell, 1919. See *E. clupearum.*
E. zurnabadensis Yakimoff, 1931a. See *E. canadensis.*

HOST–INDEX

Phylum Annelida

Perichaeta armata.—*E. ? perichaetae* (Beddard, 1888).
Perichaetae novae-zelandiae.—*E. ? perichaetae* (Beddard, 1888).

Phylum Arthropoda

Class Chilopoda

Geophilus ferruginosus. Centipede.—*E. pfeifferia* Labbé, 1896.
Himantarium gabrielis. Centipede.—*E. simondi* (Léger, 1898).
Lithobius forficatus. Centipede.—*E. lacazei* (Labbé, 1895); *E. schaudinniana* Pinto, 1928c.

Class Diplopoda

Stigmatogaster gracilis. Millipede.—*E. hagenmülleri* (Léger, 1898).
Tachypodoiulus niger. Millipede.—*E. ekdysios* Triffitt, 1928.

Class Insecta

"Coleoptera" Genus ?.—*E. ? hyalina* (Léger, 1898).
Gyrinus natator. Whirligig beetle.—*E. ? hirsuta* Schneider, 1887a.

Phylum Chordata

Subphylum Hemichordata

Glossobalanus minutus.—*E. ? beauchampi* Léger and Duboscq, 1917; *E. ? epidermica* Léger and Duboscq, 1917.

Subphylum Vertebrata

Class Elasmobranchii

Acanthias acanthias. Dogfish.—*E. lucida* (Labbé, 1893b).
Acanthias vulgaris. Spiny dogfish.—*E. lucida* (Labbé, 1893b).
Aëtobatis narinari. Devil fish.—*E. southwelli* Halawani, 1930.
Lamna cornubica. Shark.—*E. gigantea* (Labbé, 1896).
Mustelus canis. Dogfish.—*E. lucida* (Labbé, 1893b).
Mustelus vulgaris. Dogfish.—*E. lucida* (Labbé, 1893b).
Raia batis. Ray.—*E. raiarum* van den Berghe, 1937.
Scyllium catulus. Dogfish.—*E. lucida* (Labbé, 1893b).
Scyllium sp. Dogfish.—*E. scyllii* (Drago, 1902).
Scyllium stellare. Dogfish.—*E. lucida* (Labbé, 1893b).

Class Pisces

Alburnus brama. Bream.—*E. stankovitchi* Pinto, 1928c.
Alburnus lucidus. Small bleak.—*E. cylindrospora* Stankovitch, 1921; *E. stankovitchi* Pinto, 1928c.
Alosa sardina. Sardine.—*E. clupearum* (Thelohan, 1894).
Ammodytes tobianus. Sand eel.—*E. bigemina* (Labbé, 1896).
Anguilla vulgaris. Eel.—*E. anguillae* (Léger and Hollande, 1922); *E. variabilis* (Thelohan, 1893).
Barbus fluviatilis. Barbel.—*E. cyprinorum* Stankovitch, 1921.
Caranx trachurus. Horse mackerel.—*E. cruciatà* (Thelohan, 1892).
Carassius carassius.—*E. carassii* Yakimoff and Gousseff, 1935b; *E. nicollei* Yakimoff and Gousseff, 1935b.
Clinus superciliosus. Klip-fish.—*E. clini* Fantham, 1932.
Clupea harengus. Herring.—*E. clupearum* (Thelohan, 1894).
Clupea pilchardus. Sardine.—*E. clupearum* (Thelohan, 1894); *E. sardinae* (Thelohan, 1890).
Cobitis taenia. Spiny loach.—*E. cobitis* Stankovitch, 1924a; *E. misgurni* Stankovitch, 1924a.
Cottus bubalis. European father-lasher.—*E. variabilis* (Thelohan, 1893).
Cottus gobio. Bullhead.—*E. cotti* Gauthier, 1921; *E. piraudi* Gauthier, 1921.
Crenilabrus melops.—*E. variabilis* (Thelohan, 1893).
Cyprinus carpio. Carp.—*E. carpelli* Léger and Stankovitch, 1921; *E. cyprini* Plehn, 1924; *E. subepithelialis* Moroff and Fiebiger, 1905; *E. wierzejski* Hofer, 1904.
Cyprinus gobio. Whitefish.—*E. alburni* (Stankovitch, 1920).
Engraulis encrasicholus. Anchovy.—*E. clupearum* (Thelohan, 1894).
Gadus aeglifinus. Haddock.—*E. gadi* Fiebiger, 1913.
Gadus morrhua. Stockfish.—*E. gadi* Fiebiger, 1913.
Gadus virens. Coalfish.—*E. gadi* Fiebiger, 1913.
Gasterosteus aculeatus. Stickleback.—*E. gasterostei* (Thelohan, 1890).
Gasterosteus clupeatus. Stickleback.—*E. gasterostei* (Thelohan, 1890).
Gobio fluviatilis. Gudgeon.—*E. metchnikovi* (Laveran, 1897).
Gobio gobio. Goby.—*E. metchnikovi* (Laveran, 1897).
Gobius bicolor. Goby.—*E. variabilis* (Thelohan, 1893).
Gobius nudiceps. Dikkop.—*E. gobii* Fantham, 1932.
Gobius paganellus. Goby.—*E. variabilis* (Thelohan, 1893).
Harpodon nehereus. Bombay duck.—*E. harpodoni* Setna and Bana, 1935b.
"Herring."—*E. nishin* Fujita, 1934; *E. sardinae* (Thelohan, 1890).
Labrus sp. Wrasse.—*E. thelohani* (Labbé, 1896).
Lepadogaster gouani.—*E. variabilis* (Thelohan, 1893).
Leuciscus rutilus. Common roach.—*E. alburni* (Stankovitch, 1920); *E. cyprinorum* Stankovitch, 1921.

"Mackerel."—*E. sardinae* (Thelohan, 1890).
Misgurnus fossilis. Loach.—*E. misgurni* (Stankovitch, 1924a).
Motella fusca. Brown rockling.—*E. cristalloides* (Thelohan, 1893).
Motella maculata. Spotted rockling.—*E. cristalloides* (Thelohan, 1893).
Motella tricirrata. Rockling.—*E. cristalloides* (Thelohan, 1893).
Perca fluviatilis. Common perch.—*E. percae* (Dujarric de la Riviere, 1914); *E. rivieri* Yakimoff, 1929b.
Phoxinus laevis.—*E. cyprinorum* Stankovitch, 1921.
Salmo fario. Salmon.—*E. truttae* (Léger and Hesse, 1919).
Sardina melanosticta. Sardine.—*E. clupearum* (Thelohan, 1894).
Scardinius erythrothalmus. Red roach.—*E. alburni* (Stankovitch, 1920); *E. cyprinorum* Stankovitch, 1921; *E. pigra* Léger and Bory, 1932; *E. stankovitchi* Pinto, 1928c.
Scomber scomber. Mackerel.—*E. clupearum* (Thelohan, 1894).
Squalius agassizii.—*E. soufiae* Stankovitch, 1921.
Syngnathus nigrilineatus. Great pipe fish.—*E. syngnathi* Yakimoff and Gousseff, 1936c.
Tinca fluviatilis. Tench.—*E. minuta* (Thelohan, 1892).
Tinca tinca. Tench.—*E. cyprini* Plehn, 1924; *E. minuta* (Thelohan, 1892); *E. rouxi* (Elmassian, 1909).
Tinca vulgaris. Tench.—*E. cyprini* Plehn, 1924; *E. minuta* (Thelohan, 1892); *E. rouxi* (Elmassian, 1909).
Trachurus trachurus. Stichling.—*E. cruciata* (Thelohan, 1892).

Class Amphibia

Order Caudata

Salamandra atra. Salamander.—*E. grobbeni* Rudovsky, 1925; *E. salamandrae-atrae* (Phisalix, 1927).
Salamandra maculosa. Salamander.—*E. salamandrae* (Steinhaus, 1889).
Triton alpestris. Newt.—*E. canaliculata* Lavier, 1936; *E. propria* (Schneider, 1881); *E. spherica* (Schneider, 1887b); *E. tertia* Lavier, 1936; *E. labbei* nom. nov.
Triton cristatus. Newt.—*E. canaliculata* Lavier, 1936; *E. labbei* nom. nov.; *E. propria* (Schneider, 1881); *E. spherica* (Schneider, 1887b); *E. tertia* Lavier, 1936.
Triton palmatus. Newt.—*E. canaliculata* Lavier, 1936; *E. propria* (Schneider, 1881); *E. spherica* (Schneider, 1887b).
Triton punctatus. Newt.—*E. propria* (Schneider, 1881); *E. spherica* (Schneider, 1887b).
Triton pyrrhogaster. Newt.—*E. propria* (Schneider, 1881); *E. spherica* (Schneider, 1887b).
Triton taeniatus. Newt.—*E. propria* (Schneider, 1881).
Triton vulgaris. Newt.—*E. canaliculata* Lavier, 1936; *E. propria* (Schneider, 1881).

Order Salientia

Bufo melanostictus. Indian toad.—*E. laminata* Ray, 1935.
"Frog."—*E. mazzai* Yakimoff and Gousseff, 1934.
Hyla arborea. Tree frog.—*E. belawini* Yakimoff, 1930.
Leptodactylus ocellatus.—*E. leptodactyli* Carini, 1931a.
Rana esculenta.—*E. neglecta* Nöller, 1920; *E. prevoti* (Laveran and Mesnil, 1902a); *E. ranae* (Dobell, 1908); *E. ranarum* (Labbé, 1894a).
Rana temporaria.—*E. neglecta* Nöller, 1920; *E. ranae* (Dobell, 1908); *E. ranarum* (Labbé, 1894a).

Class Reptilia

Order Loricata

"Alligator."—*E. pintoi* Carini, 1931b.
Crocodilus sp. Cayman.—*E. pintoi* Carini, 1931b.
Gavialis gangeticus. Gavial.—*E. kermoganti* (Simond, 1901a).

Order Squamata

Suborder Sauria

Acanthodactylus scutellatus. Fringe-toed lizard.—*E. acanthodactyli* (Phisalix, 1930).
Agama colonorum.—*E. agamae* (Laveran and Petit, 1910).

Ameiva ameiva.—*E. boveroi* Carini and Pinto, 1926a; *E. rocha-limai* Carini and Pinto, 1926b.
Anguis fragilis. Blindworm.—*E. raillieti* (Léger, 1899).
Cnemidophorus lemniscatus lemniscatus.—*E. cnemidophori* Carini, 1941b.
Gekko japonicus. Gecko.—*E. gekkonis* Tanabe, 1928.
Hemidactylus flaviviridis. Gecko.—*E. flaviviridis* Setna and Bana, 1935a; *E. hemidactyli* Knowles and Das Gupta, 1935; *E. knowlesii* Bhatia, 1936; *E. scinci* (Phisalix, 1923).
Hemidactylus mabuia. Gecko.—*E. boveroi* Carini and Pinto, 1926a; *E. rocha-limai* Carini and Pinto, 1926b.
Mabuia maboia.—*E. maboia* Carini, 1938a.
Ophisaurus apodus. Glass snake.—*E. mirabilis* Yakimoff, 1936c.
Scincus officinalis. Skink.—*E. scinci* (Phisalix, 1932).
Tropidura torquata torquata.—*E. stenocerci* Carini, 1941a.

Suborder Serpentes

Bitis arietans. Puff adder.—*E. bitis* Fantham, 1932.
Bitis gabonica. Vipere du Gabon.—*E. crotalae* Phisalix, 1919.
Bothrops neuwiedii.—*E. amarili* Pinto, 1928a.
Cerastes cornutus.—*E. cerastis* (Chatton, 1921).
Cerastes vipera. Horned viper.—*E. cerastis* (Chatton, 1912).
Coelopeltis lacertina.—*E. coelopeltis* (Galli-Valerio, 1926).
Coluber constrictor. Blacksnake.—*E. zamenis* Phisalix, 1921.
Coluber constrictor flaviventris. Eastern blue racer.—*E. zamenis* Phisalix, 1921.
Crotalus terrificus. Rattlesnake.—*E. crotalae* Phisalix, 1919.
Drymobius bifossatus.—*E. ondinae* Carini, 1939b.
Erythrolamprus aesculapi.—*E. aesculapi* Carini, 1933b.
Leimadophis poecilogyrus.—*E. poecilogyri* Carini, 1933b.
Liophis jaegeri.—*E. jaegeri* Carini, 1933b.
Masticophis flagellus flagellus. Eastern coachwhip.—*E. zamenis* Phisalix, 1921.
Naja naja. Indian cobra.—*E. najae* Ray and Das Gupta, 1937.
Natrix piscator.—*E. gupti* Bhatia, 1938; *E. piscatori* Ray and Das Gupta, 1936.
Natrix stolata. Indian grass snake.—*E. stolatae* Ray and Das Gupta, 1938.
Python molurus. Python.—*E. pythonis* Triffitt, 1925.
Python sebae. Python.—*E. pythonis* Triffitt, 1925.
Sybinomorphus mikanii.—*E. mikanii* Carini, 1933b.
Tamnodynastes strigilis.—*E. arnoldoi* Pinto and Maciel, 1929.
Tropidonotus natrix. Ringed adder.—*E. cystis-felleae* Debaisieux, 1914; *E. tropidonoti* Guyenot, Naville and Ponse, 1922.
Tropidonotus natrix var. *persa.*—*E. persica* (Phisalix, 1925).
Zamenis (= *Coluber*) sp.—*E. zamenis* Phisalix, 1921.

Order Testudinata

Amyda spinifera. Soft shell turtle.—*E. amydae* Roudabush, 1937a; *E. dericksoni* Roudabush, 1937a.
Chrysemys marginata bellii. Western painted turtle.—*E. chrysemydis* Deeds and Jahn, 1939; *E. delagei* var. *marginata* Deeds and Jahn, 1939; *E. mitraria* (Laveran and Mesnil, 1902b).
Cistudo europaea. Box tortoise.—*E. delagei* (Labbé, 1893a).
Damonia reevesii. Terrapin.—*E. mitraria* (Laveran and Mesnil, 1902b).
Emyda granosa. Soft tortoise.—*E. legeri* (Simond, 1901b).
Emys orbicularis. European pond turtle.—*E. delagei* (Labbé, 1893a).
Lissemys punctata. Indian tortoise.—*E. koormae* Das Gupta, 1938b.
Testudo graeca. Greek tortoise.—*E. brodeni* Cerruti, 1930.
Testudo tabulata.—*E. jaboti* Carini, 1942.

Class Aves

Actitis hypoleucos.—*E. roscoviensis* (Labbé, 1893d).
Anser anser anser. Goose.—*E. anseris* Kotlan, 1932; *E. nocens* Kotlan, 1933; *E. parvula* Kotlan, 1933; *E. truncata* (Railliet and Lucet, 1891).
Anthropoides (= *Grus*) *virgo.* Demoiselle crane.—*E. gruis* Yakimoff and Matschoulsky, 1935b; *E. reichenovi* Yakimoff and Matschoulsky, 1935b.
Astur palumbarius.—*E. asturi* Galli-Valerio, 1935.
"Berghühnern" (probably *Alectoris graeca*). Mountain partridge.—*E. caucasica* Yakimoff and Buewitsch, 1932.

Bonasa umbellus. Grouse.—*E. angusta* Allen, 1934; *E. bonasae* Allen, 1934; *E. dispersa* Tyzzer, 1929.
Caccabis chucar. Stone partridge.—*E. kofoidi* Yakimoff and Matikaschwili, 1936.
Caccabis saxatalis.—*E. tenella* (Railliet and Lucet, 1891).
Calidris arenaria. Sanderling.—*E. roscoviensis* (Labbé, 1893d).
Canachites canadensis. Willow grouse.—*E. angusta* Allen, 1934; *E. bonasae* Allen, 1934.
Centrocercus urophasianus. Sage hen.—*E. angusta* Allen, 1934; *E. centrocerci* Simon, 1939.
Charadrius alexandrinus. Kentish plover.—*E. roscoviensis* (Labbé, 1893d).
Charadrius cantianus. Plover.—*E. roscoviensis* (Labbé, 1893d).
Charadrius dubius. Little ringed plover.—*E. roscoviensis* (Labbé, 1893d).
Charadrius philippinus. Plover.—*E. roscoviensis* (Labbé, 1893d).
Colinus virginianus virginianus. Bobwhite.—*E. acervulina* Tyzzer, 1929; *E. dispersa* Tyzzer, 1929; *E. dispersa* (slow developing variety) Tyzzer, 1929; *E. tenella* (Railliet and Lucet, 1891).
Columba domestica. Domestic pigeon.—*E. labbeana* Pinto, 1928c.
Columba intermedia. Indian pigeon.—*E. columbae* Mitra and Das Gupta, 1937.
Columba livia livia. Domestic pigeon.—*E. columbarum* Nieschulz, 1935; *E. labbeana* Pinto, 1928c.
Coturnus communis.—*E. dispersa* Tyzzer, 1929.
Crax fasciolata.—*E. mutum* Grecchi, 1939.
Dryobates major. Woodpecker.—*E. lyruri* Galli-Valerio, 1927; *E. yakisevi* nom. nov.
Fulica americana. American coot.—*E. paludosa* (Léger and Hesse, 1922).
Fulica atra atra. Coot.—*E. paludosa* (Léger and Hesse, 1922).
Gallinula chloropus chloropus. Moor hen.—*E. paludosa* (Léger and Hesse, 1922).
Gallus domesticus. Chicken.—*E. acervulina* Tyzzer, 1929; *E. beachi* ? Yakimoff and Rastegaïeff, 1931; *E. brunetti* Levine, 1942; *E. dispersa* Tyzzer, 1929; *E. hagani* Levine, 1938; *E. johnsoni* ? Yakimoff and Rastegaïeff, 1931; *E. maxima* Tyzzer, 1929; *E. mitis* Tyzzer, 1929; *E. necatrix* Johnson, 1930; *E. praecox* Johnson, 1930; *E. tenella* (Railliet and Lucet, 1891); *E. tyzzeri* ? Yakimoff and Rastegaïeff, 1931.
Lagopus lagopus. Grouse.—*E. bonasae* Allen, 1934.
Lagopus mutus. Ptarmigan.—*E. lagopodi* Galli-Valerio, 1929.
Lagopus scoticus. Ptarmigan.—*E. tenella* (Railliet and Lucet, 1891).
Lophortyx californica vallicola. California quail.—*E. acervulina* Tyzzer, 1929; *E. maxima* Tyzzer, 1929; *E. mitis* Tyzzer, 1929; *E. tenella* (Railliet and Lucet, 1891).
Lyrurus tetrix. Black grouse.—*E. lyruri* Galli-Valerio, 1927; *E. nadsoni* Yakimoff and Gousseff, 1936a.
Meleagris mexicana. Domesticated turkey.—*E. dispersa* Tyzzer, 1929; *E. meleagridis* Tyzzer, 1927; *E. meleagrimitis* Tyzzer, 1929.
Meleagris gallopago. Turkey.—*E. meleagridis* Tyzzer, 1927; *E. meleagrimitis* Tyzzer, 1929.
Motacilla alba. European white wag-tail.—*E. roscoviensis* (Labbé, 1893d).
Numenius phaeopus. Whimbrel.—*E. roscoviensis* (Labbé, 1893d).
Oreortyx picta plumifera. Plumed quail.—*E. acervulina* Tyzzer, 1929; *E. mitis* Tyzzer, 1929; *E. tenella* (Railliet and Lucet, 1891).
Pediocetes phasianellus campestris. Prairie sharp-tailed grouse.—*E. angusta* Allen, 1934; *E. bonasae* Allen, 1934; *E. dispersa* Tyzzer, 1929.
Pelidna torquata. Sandpiper.—*E. roscoviensis* (Labbé, 1893d).
Perdix perdix Grey partridge.—*E. kofoidi* Yakimoff and Matikaschwili, 1936; *E. procera* Haase, 1939; *E. tenella* (Railliet and Lucet, 1891).
Perdix ruber.—*E. lyruri* Galli-Valerio, 1927.
Perdix saxatalis.—*E. tenella* (Railliet and Lucet, 1891).
Phalacrocorax aristotelis. Shag.—*E. roscoviensis* (Labbé, 1893d).
Phalacrocorax carbo lugubris. Cormorant.—*E. urnula* Hoare, 1933.
Phalacrocorax cristatus. Cormorant.—*E. roscoviensis* (Labbé, 1893d).
Phasianus colchicus colchicus. English pheasant.—*E. dispersa* Tyzzer, 1929; *E. phasiani* Tyzzer, 1929; *E. tenella* (Railliet and Lucet, 1891).
Phasianus colchicus chrysomelas. Pheasant.—*E. langeroni* Yakimoff and Matschoulsky, 1937b.
Phasianus colchicus torquatus. Ring-neck pheasant.—*E. dispersa* Tyzzer, 1929; *E. megalostomata* Ormsbee, 1939; *E. pacifica* Ormsbee, 1939; *E. phasiana* Tyzzer, 1929; *E. tenella* (Railliet and Lucet, 1891).

Phasianus gordius tschardynensis. Pheasant.—*E. langeroni* Yakimoff and Matschoulsky, 1937b.
Pluvialis apricarius. Golden plover.—*E. roscoviensis* (Labbé, 1893d).
Porphrio s. *Polycephalus caeruleus.* Rail.—*E. polycephali* Yakimoff and Matschoulsky, 1939a.
Rhynchotus rufescens.—*E. rhynchoti* Reis and Nohrega, 1936.
Speotyto cunicularia grallaria. Owl.—*E. speotytoi* Carini, 1939a.
Stercorarius parasiticus.—*E. stercorariae* Galli-Valerio, 1940.
Sterna forsteri. Forster's tern.—*E. meservei* Coatney, 1935.
Strepsilas interpres.—*E. roscoviensis* (Labbé, 1893d).
Streptopelia orientalis mecna.—*E. labbeana* Pinto, 1928c.
Sturnus vulgaris. Starling.—*E. balozeti* Yakimoff and Gousseff, 1938a.
Tetrao tetrix. Moor hen.—*E. tetricis* Haase, 1939.
Tetrao urogallus. Heath cock.—*E. yakisevi,* nom. nov.; *E. procera* Haase, 1939; *E. ventriosa* Haase, 1939.
Tetrao urogallus aquitanicus. Grouse.—*E. lyruri* Galli-Valerio, 1927.
Tetrastes bonasia. Hazel grouse.—*E. angusta* Allen, 1934; *E. bonasae* Allen, 1934.
Totanus calidris. Sandpiper.—*E. roscoviensis* (Labbé, 1893d).
Totanus hypoleucos. Sandpiper.—*E. roscoviensis* (Labbé, 1893d).
Totanus totanus. Redshank.—*E. roscoviensis* (Labbé, 1893d).
Tringa alpina. Dunlin.—*E. roscoviensis* (Labbé, 1893d).

Class Mammalia

Order Marsupialia

Caluromys philander. Opossum.—*E. haberfeldi* Carini, 1937c.
Didelphys aurita. Opossum.—*E. didelphydis* Carini, 1936; *E. gambai* Carini, 1938b.
Macropus bennetti. Bennett's wallaby.—*E. macropodis* Wenyon and Scott, 1925.
Macropus giganteus. Gray kangaroo.—*E. fausti* Yakimoff and Matschoulsky, 1936; *E. marsupialium* Yakimoff and Matschoulsky, 1936.

Order Insectivora

Erinaceus europaeus. Hedgehog.—*E. ostertagi* Yakimoff and Gousseff, 1936d; *E. perardi* Yakimoff and Gousseff, 1936d.
Mogera wogura coreano.—*E. scapani* Henry, 1932b.
Scapanus latimanus. Mole.—*E. scapani* Henry, 1932b.
Sorex araneus. Shrew.—*E. chagasi* Yakimoff and Gousseff, 1935c; *E. crocidurae* Galli-Valerio, 1933; *E. dissimilis* Yakimoff and Gousseff, 1935c; *E. soricinae* Galli-Valerio, 1927; *E. soricis* Henry, 1932b.
Sorex californicus. Shrew.—*E. soricis* Henry, 1932b.
Talpa europaea. Mole.—*E. goussevi* Yakimoff, 1935b.

Order Chiroptera

Nyctinomus limbatus. Bat.—*E. dukei* Lavier, 1927.
Nyctinomus pumilus. Bat.—*E. dukei* Lavier, 1927.
Rhinolophus fer-equinum. Bat.—*E. viridis* (Labbé, 1893c).
Rhinolophus hipposideros. Bat.—*E. hessei* Lavier, 1924.

Order Carnivora

Canis familiaris. Dog.—*E. canis* Wenyon, 1923; *E. cati* Yakimoff, 1933d.
Canis lagopus. Blue fox.—*E. mesnili* Rastegaïeff, 1929.
Canis vulgaris. European fox.—*E. vulpis* Galli-Valerio, 1929.
Canis vulpes. Fox.—*E. vulpis* Galli-Valerio, 1929.
Felis domestica. Cat.—*E. canis* Wenyon, 1923; *E. cati* Yakimoff, 1933d; *E. felina* Nieschulz, 1924.
Felis leo. Lion.—*E. felina* Nieschulz, 1924.
Felis tigris. Tiger.—*E. ? hartmanni* Rastegaïeff, 1930; *E. novo-wenyoni* Rastegaïeff, 1930.
"Gelben Fuchs." Yellow fox.—*E. adleri* Yakimoff and Gousseff, 1936f.
Martes zibelina. Sable.—*E. sibirica* Yakimoff and Terwinsky, 1931.
Meles taxus. Badger.—*E. melis* Kotlan and Pospesch, 1933.
Mephitis hudsonica. Skunk.—*E. mephitidis* Andrews, 1928.
Mephitis mephitica. Skunk.—*E. mephitidis* Andrews, 1928.
Mustela nivalis. Weasel.—*E. mustelae* Iwanoff-Gobzem, 1934b.

Mustela putorius var. *furo.* Ferret.—*E. furonis* Hoare, 1927; *E. ictidea* Hoare, 1927; *E. vison* Kingscote, 1935.
Mustela vison. Mink.—*E. vison* Kingscote, 1935.
Nasua nasica.—*E. nasuae* Carini and Grechi, 1938.
Procyon lotor. Raccoon.—*E. nuttalli* Yakimoff and Matikaschwili, 1933a.
"Silver fox."—*E. canivelocis* Gousseff, 1933.
Tayra barbara. Tayra.—*E. irara* Carini and da Fonseca, 1938.
Ursus aretus. Bear.—*E. ursi* Yakimoff and Matschoulsky, 1935a.

Order Rodentia

Alactaga jaculus. Jumping hare.—*E. alactagae* Iwanoff-Gobzem, 1934b; *E. joyeuxi* Yakimoff and Gousseff, 1936e; *E. lavieri* Yakimoff and Gousseff, 1936e.
Arctomys marmota. Alpine marmot.—*E. arctomysi* Galli-Valerio, 1931; *E. marmotae* Galli-Valerio, 1924.
Arvicola nivalis. Fieldmouse.—*E. arvicolae* (Galli-Valerio, 1905).
"California rabbit."—*E. irresidua* Kessel and Jankiewicz, 1931.
Callospermophilus chrysodeirus. Golden mantled ground squirrel.—*E. bilamellata* Henry, 1932b; *E. callospermophili* Henry, 1932b.
Castor canadensis canadensis. Beaver.—*E. sprehni* Yakimoff, 1934a.
Castor fiber. Beaver.—*E. sprehni* Yakimoff, 1934a.
Cavia cobaya. Guinea pig.—*E. caviae* Sheather, 1924.
Cavia operea. Wild guinea pig.—*E. caviae* Sheather, 1924.
Cavia porcellus. Guinea pig.—*E. caviae* Sheather, 1924.
Citellus beecheyi. Ground squirrel.—*E. beecheyi* Henry, 1932b.
Citellus franklinii. Franklin's ground squirrel.—*E. eubeckeri* Hall and Knipling, 1935; *E. franklinii* Hall and Knipling, 1935.
Citellus pygmaeus. Ground squirrel.—*E. beckeri* Yakimoff and Sokoloff, 1934; *E. citelli* Kartchner and Becker, 1930; *E. volgensis* Sassuchin and Rauschenbach, 1932.
Citellus tridecemlineatus. Ground squirrel.—*E. citelli* Kartchner and Becker, 1930.
"Coniglio." Rabbit.—*E. perforans* var. *stiedae* Doria, 1933.
Cotia vermelha. Agouti.—*E. aguti* Carini, 1935; *E. cotiae* Carini, 1935; *E. paraensis* Carini, 1935.
Cricetus cricetus. Hamster.—*E. falciformis* var. *criceti* Nöller, 1920.
Cynomys ludovicianus. Prairie dog.—*E. cynomysis* Andrews, 1928.
"Eichhörnchen." Squirrel.—*E. andrewsi* Yakimoff and Gousseff, 1935a.
Geomys bursarius. Pocket gopher.—*E. geomydis* Skidmore, 1929.
Glaucomys volens. Flying squirrel.—*E. glaucomydis* Roudabush, 1937c; *E. sciurorum* Galli-Valerio, 1922.
Guerlinguetus ingrami. Squirrel.—*E. botelhoi* Carini, 1932.
Hydrochoerus capibara. Capybara.—*E. capibarae* Carini, 1937b; *E. hydrochoeri* Carini, 1937b.
Lepus americanus. Varying hare.—*E. perforans* (Leuckart, 1879); *E. stiedae* (Lindemann, 1865).
Lepus arcticus groenlandicus. Greenland hare.—*E. exigua* Yakimoff, 1934b; *E. magna* var. *robertsoni* Madsen, 1938; *E. magna* var. *robertsoni* nov. var. forma *semisculpta* Madsen, 1938; *E. perforans* var. *groenlandica* Madsen, 1938; *E. sculpta* Madsen, 1938.
Lepus californicus. Jack rabbit.—*E. magna* Perard, 1925b; *E. media* Kessel, 1929; *E. perforans* (Leuckart, 1879); *E. stiedae* (Lindemann, 1865).
Lepus cuniculus. Domestic rabbit.—*E. exigua* Yakimoff, 1934b; *E. irresidua* Kessel and Jankiewicz, 1931; *E. magna* Perard, 1925b; *E. media* Kessel, 1929; *E. neoleporis* Carvalho, 1942; *E. perforans* (Leuckart, 1879); *E. piriformis* Kotlan and Pospesch, 1934; *E. stiedae* (Lindemann, 1865).
Lepus cuniculus angoriensis. Angora rabbit.—*E. magna* Perard, 1925b.
Lepus europaeus. European hare.—*E. leporis* Nieschulz, 1923; *E. magna* Perard, 1925b; *E. perforans* (Leuckart, 1879).
Lepus timidus. Alpine hare.—*E. leporis* Nieschulz, 1923; *E. septentrionalis* Yakimoff, Matschoulsky and Spartansky, 1936; *E. stiedae* (Lindemann, 1865).
Lepus tolai. Hare.—*E. leporis* Nieschulz, 1923.
Lepus variabilis. Hare.—*E. stiedae* (Lindemann, 1865).
Marmota bobak. Marmot.—*E. monacis* Fish, 1930.
Marmota monax monax. Woodchuck.—*E. monacis* Fish, 1930; *E. os* Crouch and Becker, 1931.
Microtus arvalis. Vole.—*E. arvicolae* (Galli-Valerio, 1905).

Mus musculus. Mouse.—*E. falciformis* (Eimer, 1870); *E. hindlei* Yakimoff and Gousseff, 1938b; *E. keilini* Yakimoff and Gousseff, 1938b; *E. krijgsmanni* Yakimoff and Gousseff, 1938b; *E. musculi* Yakimoff and Gousseff, 1938b; *E. schüffneri* Yakimoff and Gousseff, 1938b.
Mus sylvaticus. Rat.—*E. muris* Galli-Valerio, 1932; *E. naye* Galli-Valerio, 1940.
Myocastor coypus. Coypu.—*E. coypi* Obitz and Wadowski, 1937.
Myopotamus caipus. Beaver.—*E. myopotami* Yakimoff, 1933a; *E. pellucida* Yakimoff, 1933a.
Myoxus quercinus.—*E. myoxi* Galli-Valerio, 1940.
Neosciurus carolinensis. Carolina squirrel.—*E. sciurorum* Galli-Valerio, 1922.
Neotoma fuscipes. Wood rat.—*E. neotomae* Henry, 1932b; *E. residua* Henry, 1932b.
Ondatra zibethica. Muskrat.—*E. ondatrae-zibethicae* Martin, 1930.
Oryzomys sp. Rat.—*E. oryzomysi* Carini, 1937a.
Otospermophilus grammurus grammurus. Colorado rock squirrel.—*E. beecheyi* Henry, 1932b.
"Rabbit."—*E. stiedae* var. *cuniculi* Graham, 1933.
Rattus norvegicus. Norway rat.—*E. halli* ? Yakimoff, 1935a; *E. miyairii* Ohira, 1912; *E. nieschulzi* Dieben, 1924; *E. separata* Becker and Hall, 1931.
Rattus rattus rattus. Black rat.—*E. hasei* Yakimoff and Gousseff, 1936b; *E. miyairii* Ohira, 1912; *E. nieschulzi* Dieben, 1924; *E. nochti* Yakimoff and Gousseff, 1936b; *E. ratti* Yakimoff and Gousseff, 1936b.
Sciurus niger rufiventer. Fox squirrel.—*E. sciurorum* Galli-Valerio, 1922.
Sciurus vulgaris. Alpine squirrel.—*E. eubeckeri* Hall and Knipling, 1935; *E. franchinii* Brunelli, 1935; *E. franklinii* Hall and Knipling, 1935; *E. piriformis* Kotlan and Pospesch, 1934; *E. sciurorum* Galli-Valerio, 1922.
Sciurus vulgaris var. *alpina.* Alpine squirrel.—*E. sciurorum* Galli-Valerio, 1922.
Sciurus vulgaris var. *noire.* Squirrel.—*E. sciurorum* Galli-Valerio, 1922.
Spermophilus eversmanni. Ground squirrel.—*E. ussuriensis* Yakimoff and Springholtz-Schmidt, 1939.
Sylvilagus brasiliensis. Rabbit.—*E. sylvilagi* Carini, 1940a.
Sylvilagus floridanus mallurus. Eastern cottontail.—*E. stiedae* (Lindemann, 1865).
Sylvilagus floridanus mearnsi. Mearn's cottontail.—*E. exigua* Yakimoff, 1934b; *E. irresidua* Kessel and Jankiewicz, 1931; *E. leporis* Nieschulz, 1923; *E. magna* Perard, 1925b; *E. media* Kessel, 1929; *E. neoleporis* Carvalho, 1942; *E. paulistana* da Fonseca, 1933b; *E. perforans* (Leuckart, 1879); *E. stiedae* (Lindemann, 1865).
Sylvilagus minensis. Rabbit.—*E. paulistana* da Fonseca, 1933b; *E. pintoensis* da Fonseca, 1933a.
Sylvilagus nuttallii grangeri. Cottontail rabbit.—*E. environ* Honess, 1939; *E. maior* Honess, 1939; *E. media* Kessel, 1929; *E. stiedae* (Lindemann, 1865).

Order Edentata

Cabassus sp. Tatu.—*E. tatusi* Carini, 1933a.
Cabassus unicinctus. Tatu.—*E. cabassusi* Carini, 1933a; *E. tatusi* Carini, 1933a.
Chaetophractus villosus.—*E. tatusi* Carini, 1933a.
Dasypus sexcinctus. Six-banded armadillo.—*E. travassosi* da Cuhna and Muniz, 1928.
Muletia hybrida. Armadillo.—*E. travassosi* da Cuhna and Muniz, 1928.
Myrmecophaga trigaetyla. Anteater.—*E* ? *escomeli* Rastegaïeff, 1930.

Order Artiodactyla

Antelocapra americana. American antelope.—*E. antelocaprae* Huizinga, 1942.
Bibos indicus. Zebu.—*E. bukidnonensis* Tubangui, 1931; *E. canadensis* Bruce, 1921; *E. ellipsoidalis* Becker and Frye, 1929; *E. zürnii* (Rivolta, 1878).
Bison bonasus. Bison.—*E. ellipsoidalis* Becker and Frye, 1929.
Bos frontalis. Gayal.—*E. ellipsoidalis* Becker and Frye, 1929.
Bos taurus. Ox.—*E. alabamensis* Christensen, 1941; *E. auburnensis* Christensen and Porter, 1939; *E. azerbaidschanica* Yakimoff, 1933b; *E. bovis* (Züblin, 1908); *E. brasiliensis* Torres and Ramos, 1939; *E. bukidnonensis* Tubangui, 1931; *E. canadensis* Bruce, 1921; *E. cylindrica* Wilson, 1931; *E. ellipsoidalis* Becker and Frye, 1929; *E. ildefonsoi* Torres and Ramos, 1939; *E. subspherica* Christensen, 1941; *E. thianethi* Gwelessiany, 1935; *E. wyomingensis* Huizinga and Winger, 1942; *E. zürnii* (Rivolta, 1878).

Boselaphus tragocamelus. Antelope.—*E. yakimovi* Rastegaïeff, 1930.
"Buffalo."—*E. thianethi* Gwelessiany, 1935.
Buffelus bubalus. Buffalo.—*E. azerbaidschanica* Yakimoff, 1933b.
"Camel."—*E. dromedarii* Yakimoff and Matschoulsky, 1939b.
Camelus bactrianus. Bactrian camel.—*E. cameli* Nöller, 1932.
Capella rupicapra. Chamois.—*E. arloingi* (Marotel, 1905); *E. capreoli* Galli-Valerio, 1927; *E. faurei* (Moussu and Marotel, 1902); *E. riedmülleri* Yakimoff and Matschoulsky, 1940; *E. rupicaprae* Galli-Valerio, 1924.
Capreolus capreolus.—*E. cervi* Galli-Valerio, 1927.
Capra hircus. Domestic goat.—*E. arloingi* (Marotel, 1905); *E. intricata* Spiegl, 1925; *E. longispora* Rudovsky, 1922; *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930; *E. parva* Kotlan, Mocsy and Vajda, 1929.
Capra hircus angoriensis. Angora goat.—*E. arloingi* (Marotel, 1905).
Capra ibex. Alpine ibex.—*E. arloingi* (Marotel, 1905); *E. faurei* (Moussu and Marotel, 1902).
Capra sibirica. Goat.—*E. faurei* (Moussu and Marotel, 1902); *E. nana* Yakimoff, 1933c; *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930; *E. parva* Kotlan, Mocsy and Vajda, 1929.
"Carabao."—*E. zürnii* (Rivolta, 1878).
Cervus axis. Spotted deer.—*E. wassilewskyi* Rastegaïeff, 1930.
Cervus canadensis. Wapiti.—*E. hegneri* Rastegaïeff, 1930; *E. zürnii* (Rivolta, 1878).
Cervus capreolus. Roe deer.—*E. capreoli* Galli-Valerio, 1927.
Cervus elaphus. Stag.—*E. bukidnonensis* Tubangui, 1931; *E. cervi* Galli-Valerio, 1927; *E. galli-valerioi* Rastegaïeff, 1930; *E. wassilewskyi* Rastegaïeff, 1930.
Cobus ellipsiprymnus. Antelope.—*E. macieli* Yakimoff and Matschoulsky, 1938b.
Coelogenus paca. Paka.—*E.* ? *nölleri* Rastegaïeff, 1930.
Dama dama. Deer.—*E. galli-valerioi* Rastegaïeff, 1930.
Gazella subgutturosa. Persian gazelle.—*E. elegans* Yakimoff, Gousseff and Rastegaïeff, 1932; *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930.
Hemmitragus jemlaicus. Thar.—*E. arloingi* (Marotel, 1905).
Lama glama. Llama.—*E. peruviana* Yakimoff, 1934c.
Orias canna. Eland.—*E. canna* Triffitt, 1924; *E. triffittae* Yakimoff, 1934c.
Ovis aries. Sheep.—*E. ah-sa-to* Honess, 1942; *E. arloingi* (Marotel, 1905); *E. faurei* (Moussu and Marotel, 1902); *E. granulosa* Christensen, 1938b; *E. intricata* Spiegl, 1925; *E. longispora* Rudovsky, 1922; *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930; *E. pallida* Christensen, 1938b; *E. parva* Kotlan, Mocsy and Vajda, 1929.
Ovis aries germanica. Sheep.—*E. arloingi* (Marotel, 1905).
Ovis aries oasica. Sheep.—*E. intricata* Spiegl, 1925.
Ovis aries platygura var. *astracanensis.* Sheep.—*E. arloingi* (Marotel, 1905).
Ovis aries steatopyga. Sheep.—*E. arloingi* (Marotel, 1905).
Ovis aries steatopyga var. *somalica.* Sheep.—*E. arloingi* (Marotel, 1905); *E. intricata* Spiegl, 1925.
Ovis aries strepsiceros var. *hortob.* Sheep.—*E. arloingi* (Marotel, 1905); *E. intricata* Spiegl, 1925.
Ovis arkhar. Sheep.—*E. arkhari* Yakimoff and Matschoulsky, 1937a; *E. faurei* (Moussu and Marotel, 1902); *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930.
Ovis canadensis canadensis. Rocky Mountain bighorn.—*E. ah-sa-ta* Honess, 1942; *E. crandallis* Honess, 1942; *E. faurei* (Moussu and Marotel, 1905); *E. intricata* Spiegl, 1925; *E. ninae-kohl-yokimovae* Yakimoff and Rastegaïeff, 1930; *E. parva* Kotlan, Mocsy and Vajda, 1929.
Ovis musimon. Moufflon.—*E. arloingi* (Marotel, 1905); *E. faurei* (Moussu and Marotel, 1902); *E. intricata* Spiegl, 1925; *E. nana* Yakimoff, 1933c; *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930.
Ovis nivicola. Sheep.—*E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930; *E. parva* Kotlan, Mocsy and Vajda, 1929.
Ovis ophion armeniana. Sheep.—*E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930.
Ovis orientalis. Sheep.—*E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930.
Ovis polii polii. Sheep.—*E. arkhari* Yakimoff and Matschoulsky, 1937a; *E. arloingi* (Marotel, 1905); *E. faurei* (Moussu and Marotel, 1902).
Ovis polii sewerzowi. Sheep.—*E. arkhari* Yakimoff and Matschoulsky, 1937a; *E. arloingi* (Marotel, 1905); *E. faurei* (Moussu and Marotel, 1902).
Ovis tragelaphus. Aoudad.—*E. faurei* (Moussu and Marotel, 1902); *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930; *E. parva* Kotlan, Mocsy and Vajda. 1929.

Ovis vignei. Sheep.—*E. arkhari* Yakimoff and Matschoulsky, 1937a; *E. faurei* (Moussu and Marotel, 1902); *E. ninae-kohl-yakimovae* Yakimoff and Rastegaïeff, 1930.

Pseudaxis dybovsky.—*E. wassilewskyi* Rastegaïeff, 1930.

Rangifer tarandus. Reindeer.—*E. arctica* Yakimoff, Matschoulsky and Spartansky, 1939; *E. mayeri* Yakimoff, Sokoloff and Matschoulsky, 1936; *E. mühlensi* Yakimoff, Sokoloff and Matschoulsky, 1936; *E. polaris* Yakimoff and Sokoloff, 1935; *E. tarandina* Yakimoff, Sokoloff and Matschoulsky, 1936.

Sus scrofa domestica. Pig.—*E. deblieckí* Douwes, 1921; *E. perminuta* Henry, 1931a; *E. scabra* Henry, 1931a; *E. scrofae* Galli-Valerio, 1935; *E. spinosa* Henry, 1931a.

Sus scrofa ferus. Pig.—*E. deblieckí* Douwes, 1921; *E. scabra* Henry, 1931a.

Suborder Perissodactyla

"Donkey."—*E. solipedum* Gousseff, 1934.

Equus caballus. Horse.—*E. solipedum* Gousseff, 1934; *E. uniungulata* Gousseff, 1934; *E. utinensis* Selan and Vittorio, 1924.

"Mule."—*E. solipedum* Gousseff, 1934.

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The genus *Filaroides* van Beneden, 1858, and its relatives: Preliminary note. Ellsworth C. Dougherty, Department of Zoölogy, University of California, Berkeley, California.

The genus *Filaroides* v. Beneden, 1858, includes certain nematodes of the superfamily Metastrongyloidea Lane, 1917, which have undergone almost complete loss of the typical strongyline bursa. The cuticular part of the bursa is rudimen-

tary or lacking, and the bursal rays are little more than papillae. Because of this reduction from the typical strongyline condition the species of *Filaroides* have had a long history of incorrect allocation to the suborder Spirurina, in which they have been classified in both the superfamily Filarioidea Weinland, 1858, and the superfamily Spiruroidea Railliet and Henry, 1915. I have made during the past two years an exhaustive study of the literature on *Filaroides* and its relatives and have also been able to study specimens belonging to several species of the genus,—*F. martis* from mustelids, *F. osleri* from dogs, and undescribed species from sealions. The results of this study have been prepared for publication, but because of the length of the paper its appearance will be delayed for some time. In the meantime I wish to employ in shorter papers the taxonomic designations which I have determined to be correct for species of *Filaroides* and for related forms and therefore believe that the best procedure is to establish them in a preliminary note. Of necessity all evidence for my taxonomic decisions cannot be given now, but I include here a list of the most important references, which will facilitate checking of the principal points.

Metastrongyloids, occurring in terrestrial mammals and exhibiting extreme reduction of the bursa, may be placed in three genera: *Filaroides* v. Beneden, 1858, *Metathelazia* Skinker, 1931, and *Muellerius* Cameron, 1927. *Muellerius* is undoubtedly closely related to the genus *Protostrongylus* Kamenskiĭ, 1905, and allied genera, as suggested by Neveu-Lemaire (1936). I believe that *Filaroides* and *Metathelazia* are, on the other hand, most closely related to the genus *Aelurostrongylus* Cameron, 1927. This view is based on several facts: that morphologically *Filaroides* and *Aelurostrongylus* are very close, the species *A. falciformis* (Schlegel, 1933) Wetzel, 1938, exhibiting reduction of the bursa approaching that in *Filaroides;* that species of both genera and also of *Metathelazia* occur in carnivores; and that species of both genera employ terrestrial gasteropods (snails and slugs) as intermediate hosts, as Petrov and Gagarin (1937) have shown for *F. martis* (Werner, 1782), comb. nov. (syn. *F. bronchialis*), and Wetzel (1937) for *A. falciformis.* Neither the *Protostrongylus-* nor the *Aelurostrongylus*-group is, in my opinion, closely related to the lungworms of porpoises—*Pseudalius* Dujardin, 1844, and its allies, which exhibit an essentially different type of bursal reduction. I can at this time indicate only roughly the systematic units into which these several groups should fall, inasmuch as the current composition of the superfamily Metastrongyloidea is, in my estimation, in part unnatural. Therefore I propose that *Protostrongylus* and *Aelurostrongylus* with their allies be left in the family Metastrongylidae Leiper, 1908, and *Pseudalius* and its allies in the family Pseudaliidae Railliet, 1916. This is in partial disagreement with the recent classifications adopted by Chitwood (1937) and Skrîabin (1941), who have placed *Filaroides* in a subfamily Filaroidinae Skrîabin, 1933, of the family Pseudaliidae.

The position of *Filaroides* has a vital bearing on a major aspect of a theory of the evolution of the nematode class Phasmidea (or subclass Phasmidia) proposed by Skrîabin (1941). This problem cannot, however, be discussed within the confines of this paper.

As synonyms of *Filaroides* and *Metathelazia* a number of generic and subgeneric names must fall. These synonymizings have in part been indicated by previous investigators. Within each genus several species may be recognized. A number of different specific names and combinations have been applied to certain of the species, and thus a number of synonyms exist for the correct names of these. Of especial note is the name of the genotype of *Filaroides*—*F. martis.* This species is currently designated either as *F. bronchialis* (Werner, 1782) or as *F. bronchialis* (Gmelin, 1790). Werner (1782) actually employed for it the name *Gordius martis,* and it is erroneous to attribute the designation "bronchialis" to him,

although Soviet helminthologists have persisted in this mistake since Petrov (1927) first employed the designation *F. bronchialis* (Werner, 1782).

In the following list the synonyms, genotypes, and species of *Filaroides* and *Metathelazia* are presented, and for each species its synonyms and type host. For both genera and also for their species the important references are given; most of the less important ones can be located with the help of Stiles and Hassall's index-catalogue to roundworms (1920) and their author catalogues. The generic, subgeneric, and specific names that are here reduced to synonymy for the first time are marked with an asterisk [*].

Filaroides v. Beneden, 1858 (see: van Beneden, 1858; Skrîabin, 1933, 1940).

SYNONYMY.—*Oslerus* Hall, 1921; *Osterus* Travassos, 1925 (*err. pro Oslerus*); *Filariopsis* v. Thiel, 1926; *Pseudostrongylus* Cameron, 1927; *Filarioides* Law and Kennedy, 1932 (*err. pro Filaroides*); *Oslenus* Skrîabin, 1940 (*err. pro Oslerus*).

GENOTYPE.—*F. martis* (Werner, 1782), comb. nov.

SPECIES.—

Filaroides martis (Werner, 1782), comb. nov. (see: Werner, 1782; van Beneden, 1858; Petrov, 1927, 1928; Cameron, 1927; Baer, 1931).

SYNONYMY.—*Gordius martis* Werner, 1782; *Ascaris bronchialis* Gmelin, 1790; *Taenia gulonis* Gmelin, 1790; *Fusaria bronchialis* (Gmelin, 1790) Zeder, 1803; *Cysticercus gulonis* (Gmelin, 1790) Zeder, 1803; *Strongylus foinae* Rudolphi, 1809; [*Vermis generis dubii*] *mustelae foinae, martis et putorii* Rudolphi, 1810; *Filaria mustelarum pulmonalis* Rudolphi, 1819; *Dubium mustelarum* Rudolphi, 1819; Filaires des martes et des putois, of Dujardin, 1844; *Gordius mustelarum* Werner, 1782, of Dujardin, 1844; *Filaroides mustelarum* (Rudolphi, 1819) v. Beneden, 1858 [*nec Filaroides mustelarum*, of Weijenbergh, 1858, and others]; *Filaroides bronchialis* (Werner, 1782), of Petrov, 1927; lungworm, in Sable (*Martes zibellina*), of Bykhovskiĭ (Bichowsky), 1927; *Pseudostrongylus putorius* Cameron, 1927; *Filaroides bronchialis* (Gmelin, 1790), of Baer, 1931 [*nec Filaroides bronchialis* (Gmelin, 1790), of Baylis and Daubney, 1926]; *Oslerus* sp. Hanson, 1932; *Filaroides* (*Filaroides*) *bronchialis* (Werner, 1782), of Skrîabin, 1933.

TYPE HOST.—Pine marten, *Martes m. martes* (Linné).

Filaroides osleri (Cobbold, 1879) Skrîabin, 1933 (see: Cobbold, 1879; Rabe, 1883; Hall, 1921; Skrîabin, 1933).

SYNONYMY.—*Strongylus canis bronchialis* Osler, 1877; *Filaria osleri* Cobbold, 1879; *Strongylus canis pulmonalis* v. Linstow, 1896; *Strongylus bronchialis canis* Railliet, 1898; *Pseudalius osleri* (Cobbold, 1879) Railliet, 1915; *Oslerus osleri* (Cobbold, 1879) Hall, 1921; *Osterus osteri* Travassos, 1925 (*err. pro Oslerus osleri*); *Filaroides* (*Oslerus*) *osleri* (Cobbold, 1879) Skrîabin, 1933; *?Oslerus osleri blumbergi* Orlov, 1933, *teste* Skrîabin, 1933.

TYPE HOST.—Domestic dog, *Canis familiaris* Linné.

Filaroides kreisi, sp. nov.[1] (see: Kreis, 1938, 1940).

SYNONYMY.—*Stenurus* sp. Kreis, 1938.

TYPE HOST.—Cape hunting dog, *Lycaon pictus* (Temminck) (?subsp.).

TYPE SPECIMENS.—Naturhistorisches Museum Basel (see Kreis, 1940, p. 164).

Filaroides myonactis[2] Sandground, 1937, emend. nov. (see: Sandground, 1937).

SYNONYMY.—*Filaroides myonaxi* Sandground, 1937.

TYPE HOST.—[One of the Black-tipped mongooses], *Myonax sanguineus proteus* (Allen).

Filaroides barretoi (Travassos, 1921) Gebauer, 1933 (see: Travassos, 1921; Gebauer, 1933).

SYNONYMY.—*Oslerus barretoi* Travassos, 1921.

TYPE HOST.—Common squirrel monkey, *Saimiri sciurea* (Linné).

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[1] This species is closest to *F. osleri* from which it differs by a strongly developed stoma. Only female worms were recovered. It is named in honor of its discoverer, Dr. Hans A. Kreis, Hygienische Institut, Universität Basel, Switzerland.

[2] From μῦς, mouse, and ἄναξ (gen. ἄνακτος), tyrant.

Filaroides gordius (Travassos, 1921) Gebauer, 1933 (see: Travassos, 1921; Gebauer, 1933).

SYNONYMY.—*Oslerus gordius* Travassos, 1921.

TYPE HOST.—Common marmoset, *Callithrix jacchus* (Linné).

1940; *?Oslerus* sp. Travassos, Pinto, and Muniz, 1926; *?Oslerus* sp. Tra-

Filaroides asper (v. Thiel, 1926) Skrîabin, 1940 (see: van Thiel, 1926; Skrîabin, 1940).

SYNONYMY.—*Filariopsis asper* v. Thiel, 1926; *Filaroides asper* (v. Thiel, 1926) Skriabin, 1939, of Skrîabin, 1940.

TYPE HOST.—Red howler, *Alouatta seniculus* (Linné).

Filaroides arator (Chandler, 1931) Skrîabin, 1940 (see: Chandler, 1931; Wehr, 1935; Skrîabin, 1940).

SYNONYMY.—*Filariopsis arator* Chandler, 1931; **Filaroides cebi* Gebauer, 1933; *Filaroides arator* (Chandler, 1931) Skriabin, 1939, of Skrîabin, 1940; *?Oslerus* sp. Travassos. Pinto, and Muniz, 1926; *?Oslerus* sp. Travassos and Texeira de Freitas, 1939.

TYPE HOST.—[A capuchin monkey] *Cebus* sp.

Filaroides gymnurus (Railliet, 1899), comb. nov. (see: Railliet, 1899; Baylis and Daubney, 1925).

SYNONYMY.—*Pseudalius gymnurus* Railliet, 1899; *Halocercus gymnurus* (Railliet, 1899) Baylis and Daubney, 1925.

TYPE HOST.—Harbor seal, *Phoca v. vitulina* Linné.

Filaroides spp. nov.

HOSTS.—California sea-lion, *Zalophus californianus* (Lesson) (one species); Steller sea-lion, *Eumetopias jubata* (Schreber) (two species).

Metathelazia Skinker, 1931 (see: Skinker, 1931).

SYNONYMY.—**Osleroides* Orlov, Davtîan, and Lîubimov, in Skrîabin, 1933; **Vogeloides* Orlov, Davtîan, and Lîubimov, in Skrîabin, 1933; *Ossleroides* Davtîan, 1933 (*err. pro Osleroides*); **Pneumospirura* Wu and Hu, 1938 (also given as new by Wu and Hu, 1940).

GENOTYPE.—*M. californica* Skinker, 1931.

SPECIES.—

Metathelazia californica Skinker, 1931 (see: Skinker, 1931).

SYNTYPE HOSTS.—California wildcat, *Lynx rufus californicus* Mearns; Rocky Mountain lion, *Puma concolor hippolestes* (Merriam).

Metathelazia massino (Davtîan, 1933), comb. nov. (see: Skrîabin, 1933; Davtîan, 1933; Orlov, Davtîan, and Lîubimov, 1933).

SYNONYMY.—*Osleroides massino* Davtîan, in Skrîabin, 1933; *Osleroides* (*Osleroides*) *massino* Davtîan, 1933, of Skrîabin, 1933; *Ossleroides massino* (Davtian, 1933) Davtîan, 1933 (*err. pro Osleroides massino*).

TYPE HOST.—Domestic cat, *Felis catus* Linné.

Metathelazia felis (Vogel, 1928), comb. nov. (see: Vogel, 1928).

SYNONYMY.—*Oslerus felis* Vogel, 1928; *Oslerus* sp. Cameron, 1931; *Osleroides* (*Osleroides*) *felis* (Vogel, 1928) Orlov, Davtîan, and Lîubimov, in Skrîabin, 1933; *Vogeloides felis* (Vogel, 1928) Davtîan, 1933.

Metathelazia hainanensis (Wu and Hu, 1938), comb. nov. (see: Wu and Hu, 1938, 1940).

SYNONYMY.—*Pneumospirura hainanensis* Wu and Hu, 1938 (also given as new by Wu and Hu, 1940).

TYPE HOST.—Eastern Chinese otter, *Lutra lutra chinensis* Gray.

Metathelazia ascaroides (v. Linstow, 1879), comb. nov. (see: von Linstow, 1879; Vogel, 1928; Gebauer, 1933).

SYNONYMY.—*Filaria ascaroides* v. Linstow, 1879; **Oslerus cynopitheci* Vogel, 1928; *Oslerus ascaroides* (v. Linstow, 1879) Gebauer, 1933; *Oslerus* sp. Gebauer, 1933; *Osleroides* (*Vogeloides*) *cynopitheci* (Vogel, 1928) Orlov, Davtîan, and Lîubimov, in Skrîabin, 1933; *Filaroides ascaroides* (v. Linstow, 1879) Gebauer, 1933, of Skrîabin, 1940.

TYPE HOST.—Mona guenon, *Cercopithecus mona* (Linné).

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The lungworms of porpoises: A correction. Ellsworth C. Dougherty, University of California, Department of Zoölogy, Berkeley, California.

Recently, in a review of the nomenclature of nematodes parasitic in porpoises and belonging to the family Pseudaliidae Railliet, 1916, I (Dougherty, 1943, Proc. Helminth. Soc. Wash. **10**(1): 16–22) pointed out that a species occurring in the Harbor porpoise (*Phocoena phocoena*) and known for some time as *Stenurus minor* (Kuhn, 1829) Baylis and Daubney, 1925 (syn. *Strongylus minor* Kuhn, 1829) could not bear the designation "minor." The reason for such a decision lay in the fact that "minor" had already been employed by Rudolphi (1819, Entozoorum synopsis cui accedunt mantissa duplex et indices locupletissimi, p. 34) as a variety name within a different species in the genus *Strongylus*, namely for *Strongylus retortaeformis* var. *minor* (= *Trichostrongylus retortaeformis* (Zeder, 1800) Looss, 1905). In view of the fact that zoölogists have in general adopted the policy of regarding such variety names as equivalent to subspecific names, which in turn are nomenclatorially equal to specific names according to the Rules of Zoölogical Nomenclature, I therefore rejected the designation "minor" for Kuhn's *Strongylus minor*. I also expressed the view that the name *Strongylus vagans*, established by Eschricht (1841, Edinburgh New Phil. Jour. [n.s.] **31**: 314–356) and regarded by subsequent investigators as synonymous with *Strongylus minor* Kuhn, 1829, actually applied to *Pharurus convolutus* (Kuhn, 1829) Dougherty, 1943. Since no other name was available for Kuhn's species, I accordingly named it *Stenurus phocoenae*.

I have subsequently obtained a copy of a paper by Raspail (1829, Ann. des Sci. d'Obesrvation **2**: 244–254) which causes me to revise my opinion on the status of Eschricht's *Strongylus vagans*. Raspail's work does not enter into direct nomenclatorial consideration, but it has served to show me that I have erred in the interpretation of Eschricht's species. Eschricht accompanied his use of *Strongylus*

vagans with a very brief description of the nematode so designated (p. 345): "... in company with the large *Strongyli inflexi*, there commonly are found smaller ones lying loosely in the branches of the trachea, which Rudolphi considers of the same species. The smaller ones have not only a different shape, but their reproductive organs are as much developed as are those of the large ones; the penis is always protruded, and of a different shape, the uteri are full of ova and living young. This, I cannot but regard these smaller worms as of a different species. ..." Of the four pseudaliid species occurring in the Harbor porpoise Eschricht could have included under the name *Strongylus vagans* only two species—either *Pharurus convolutus* or the form called by me *Stenurus phocoenae*. The spicules in specimens of the former species usually protrude, whereas I have never observed this phenomenon in specimens of the latter. It is interesting to compare this description with Raspail's diagnosis of a form undoubtedly the same as *Strongylus minor* Kuhn, 1829 and designated by him as *Strongylus inflexus* var. *minor* and as *Strongylus minor* (with *inflexus* understood) (p. 225): "Var. β. *Strongylus minor* O^{m}, 025 longus, utrinque attenuatus; *caudâ* foeminae inconspicuè bilobâ. *Penè* maris semper exserto." It can be seen that both Eschricht and Raspail dealt with forms in which they claimed the "penis" to be permanently protruded. I interpreted in my previous paper the word "penis" to indicate the spicules, the typical nematode male copulatory organs; but in this assumption I apparently was mistaken.

In Raspail's drawings (pl. 8, figs. 10–11) it can be clearly seen that the organ designated by him as the "penis" is in actuality the *dorsal bursal ray*. Either his means of clearing did not give evidence of the spicules, or he was unable to interpret them correctly. I now believe for several reasons that Eschricht also made this error: the spicules of *P. convolutus* are clearly double, whereas Eschricht used the singular form of the word "penis"; *P. convolutus*, although smaller than *Ps. inflexus* is not so strikingly different in shape as Kuhn's species, which is short and relatively much thicker; Eschricht did little work on nematodes, and in light of this fact errors in his interpretation of nematode morphology are understandable. Therefore there is no reasonable doubt that Eschricht dealt, not with *P. convolutus* as I had supposed, but with Kuhn's species. It thus follows that its correct name becomes *Stenurus vagans* (Eschricht, 1841), comb. nov., and that my name *Stenurus phocoenae* is accordingly a synonym. The synonymy of *S. vagans* may be listed as follows:

Stenurus vagans (Eschricht, 1841), comb. nov. Synonymy: *Strongylus minor* Kuhn, 1829 [*nec Strongylus retortaeformis* var. *minor* Rudolphi, 1819]; *Strongylus inflexus* var. *minor* Raspail, 1829; *Strongylus vagans* Eschricht, 1841; *Stenurus inflexus* Dujardin, 1844 [*nec Strongylus inflexus* Rudolphi, 1808]; *Prosthecosacter minor* (Kuhn, 1829) Diesing, 1851; *Prosthecosacter* (*Stenurus*) *minor* (Kuhn, 1829) Diesing, 1851 [of Diesing, 1861]; *Pseudalius minor* (Kuhn, 1829) Schneider, 1866; *Pharurus minor* (Kuhn, 1829) Cobbold, 1879; *Stenurus minor* (Kuhn, 1829) Baylis and Daubney, 1925; *Stenurus phocoenae* Dougherty, 1943.

The tolerance of 40 varieties of narcissus to a hot-water-formalin treatment based on the experiments of 1939–40 and 1940–41.[1] F. S. Blanton, Bureau of Entomology and Plant Quarantine, and B. G. Chitwood, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture.

INTRODUCTION

In an earlier paper[2] the writers have given the results of one year's study on the

[1] The writers gratefully acknowledge the cooperation of A. Frylink and Sons, who loaned the bulbs.

[2] Proc. Helminthol. Soc. Wash. 7(2): 91–94. 1940.

tolerance of 40 varieties of narcissus to a hot-water-formalin treatment as used

for the control of the bulb and stem nematode, *Ditylenchus dipsaci* (Kühn) Filipjev. This study was continued for two more seasons with the object of determining whether any injury to narcissus planting stock resulted from the hot-water-formalin treatment, which is known to cause flower injury in forcing stock. The relative increase in weight of treated and untreated lots during one season's growth was chosen as the index of injury.

It is the purpose of this paper to report the results of the second and third years' treatments of the same varieties of bulbs from the same stocks. As mentioned in the paper cited, the same stocks of bulbs were to be used over a period of years. Each year 50 bulbs of each variety were selected at random from the original stock for treating and 50 bulbs were likewise selected for the control. The two lots of each variety (treated and untreated in 1938–39) were alternated in 1939–40. In 1940–41 the treated and untreated lots of 1939–40 were mixed and the bulbs were again divided into two lots, this time at random, for the 1940–41 experiment.

METHODS

The treating dates for the two years' tests reported here were September 4, 1939, and September 1, 1940, respectively. But for the exception mentioned below, the treating procedure was the same as reported in the paper cited, i.e., the bulbs were first presoaked in water at 70° to 80° F. for a period of 2 hours, then placed in a hot-water-formalin solution consisting of 1 part of commercial formalin (40 per cent formaldehyde) in 200 parts of water and held at a temperature of 110° F. for a period of 4 hours exclusive of the "approach period." The approach period is the time required to heat the center of the bulbs to the temperature of 110° F., and was usually 30 minutes for these bulbs. There was no presoak for the bulbs treated in 1940, but with this exception the treating procedure was the same as in 1939. After treatment the bulbs were dipped in a suspension of 1 pound of 2 per cent ethyl mercury chloride (Ceresan) in 8 gallons of water, as a precautionary measure against basal rot. The bulbs were then weighed individually and planted in the field. Each variety was represented by approximately 100 bulbs, except that there were two lots of 100 bulbs each of the variety Croesus. Half the bulbs of each variety were treated and the other half served as a control.

The bulbs were planted in beds 36 inches wide, the transverse rows, 10 inches apart, receiving 10 bulbs each. Each variety thus occupied a space 100 by 36 inches including 5 rows of treated bulbs followed by 5 rows of the corresponding control lot. After the bulbs were dug they were allowed to dry for a period of 2 weeks and were then weighed. The results are presented in terms of differences between the per cent increase in weight of the treated lot and the per cent increase in weight of the corresponding untreated lot.

RESULTS

The results of the 2 years' experiments are illustrated in figure 1. In this chart the relative percentage increase in weight of the treated lot of bulbs of each variety as compared with the check is indicated by a bar of either positive or negative value. If the bar has a positive value (above the horizontal line at 0), the treated lot of this variety increased in weight more than the control; while if it has a negative value (below the horizontal line at 0), it increased less than the control. The length of the bars indicates the percentage of this difference between treatment and control. Diagonal shading with the lines ascending from left to right is used for the 1939–40 results, while diagonal shading with the lines descending from left to right is used for the 1940–41 results. When both years' results were either positive or negative, the results are superimposed and the shading cross-hatched.

The varieties have been listed according to their divisions (Classified list of daffodils, London, 1937). The varieties Cheerfulness and Odorus Plenus, both of which are double varieties and would fall in division 10, are placed in the division representing the probable percentage, these divisions being 8 and 7, respectively.

From a study of the figure, wide divergence in the results of the 2 years' data is apparent. There appears to be no correlation between the tolerance exhibited by a given variety in 2 successive years, i.e., a variety may show a positive value one year and a negative value the second, or vice versa. The number of varieties showing positive or negative values both years is no greater than might be expected from chance distribution. All that one may say of the data obtained is that over a period of 2 years about half the varieties showed a greater increase of weight in the treatment than in the control while the other half of the varieties tested

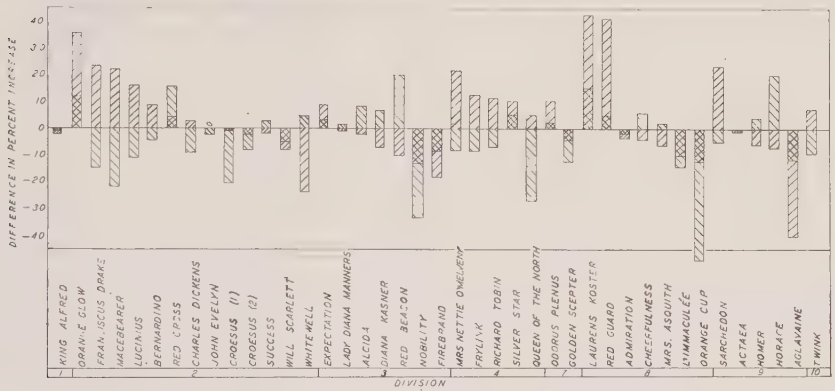

FIG. 1. The positive and negative differences in the mean percentage increase in weight of bulbs treated with formalin 1: 200 at 110° F. for 4 hours. The horizontal line at 0 represents the percentage increase of the controls while the column blocks represent the differences in per cent increase from that of the control for each variety. Positive differences (above the horizontal line at 0) favor the treatment, while negative differences (below the horizontal line at 0) favor the control. The bars with shading lines ascending from left to right indicate the results for the year 1939–40, while the bars with shading lines descending from left to right indicate the results for the year 1940–41. Cross hatching indicates superimposed records.

showed the reverse. The 1939–40 tests, with presoak, showed 2.8 per cent more increase in weight than the corresponding controls; whereas the 1940–41 tests, without presoak, showed 3 per cent less increase than corresponding controls. Other experiments have indicated the possibility that a presoak is beneficial from the standpoint of host tolerance. The present data lend support to this hypothesis.

When the bulbs were weighed at harvest time, those affected with basal rot were recorded. In 1939–40, 11 bulbs were found thus affected in the treated samples and 26 bulbs in the untreated samples; while in 1940–41, 33 bulbs were found in the treated samples and 41 in the untreated samples. This indicates that basal rot is not spread by the 4-hour hot-water-formalin treatment but may even be reduced to a minor extent.

DISCUSSION

The results in this paper differ from those reported for the first year's work in that a lesser number of the varieties were injured by the treatment. The fact that the bulbs in the treatments reported earlier were much smaller than those in the tests discussed here may account for some of these differences. It is well known

from numerous tests conducted with thermal treatments that the amount of injury is somewhat dependent on the condition of the bulb at the time of treatment. There is no evidence that the extent of injury can be predicted prior to treatment. Bulbs treated on the same date in different years may react differently, owing to the internal development of the bulb, which may be influenced by environmental conditions during the period from harvest to treating date. Climatic conditions during the growing season, which may prolong or shorten the growth period, also tend to influence the results of heat treatments.

The data for the 3 years' treatments 1938–40 indicate no apparent correlation in degree of injury between any two of these years or between varieties within any one year.

CONCLUSION

From 3 years' observations with 40 varieties of narcissus it was found that a treatment of the bulbs at a temperature of 110° F. for a duration of 4 hours in hot-water-formalin (1 part formalin to 200 parts of water) with or without a 2-hour aqueous presoak at 70–80° F. may or may not cause injury to narcissus bulbs, which is usually expressed by a decrease in yield as compared with the untreated bulbs. There is no evidence that the extent of injury can be predicted; the average injury, however, is not very great.

Cacopaurus pestis, nov. gen., nov. spec. (Nematoda: Criconematinae), a destructive parasite of the walnut, _Juglans regia_ Linn. GERALD THORNE, U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering, Salt Lake City, Utah.

Specimens of Persian walnut roots, *Juglans regia* Linn., variety Mayette on original seedling rootstocks, were sent to the writer on May 17, 1942, by Mr. E. F. Serr, Extension Specialist in Deciduous Fruits, University of California.[1] This material came from a 30-acre orchard planted in 1902–1903 near Santa Clara, California. According to statements made by the owner, tree growth had been normal until 1936 except for a few trees which had died from unknown causes in about 1930 and which were replaced by trees of the variety Mayette propagated on roots of the Hinds black walnut, *J. hindsii* Jepson. "Dieback" appeared in 1937 following a cold wave during which the temperature dropped to 19° F. on January 9, causing considerable damage to the orchard. This dieback condition progressed so rapidly that by 1940 several trees had succumbed and many more were in various stages of decline. The injury was first manifested by a reduction in the size and number of leaves, twigs, and nuts and, in a few years, culminated in complete defoliation and death of the trees.

Examination of the roots revealed the presence of enormous numbers of a very small nematode, of the Subfamily Criconematinae Taylor, 1936, which is here described as *Cacopaurus pestis*, nov. gen., nov. spec. Attack was so general on the affected trees that almost all small roots were dead or dying and those up to half an inch in diameter bore extensive lesions which were rapidly destroying them. These lesions probably were due to a combination of nemic, fungous and bacterial action but the nematodes appeared to be the primary causal organism.

As previously mentioned, "dieback" was first noted following the cold wave of January 1937 when the temperature dropped to 19° F., but frost injury only seemed scarcely sufficient to have brought about its sudden appearance. A study of the rainfall records during the life of the orchard revealed that in the first 17 years, 1902–1918, there had been an accumulated excess above normal of 22.59

[1] The writer is indebted to Mr. Serr and Dr. A. E. Davey for collections of material and data on the orchard.

FIG. 1. *Cacopaurus pestis.* A—Anterior portion of young larva; × 1800. B—Posterior portion of male, slightly subdorsal view with bursa in profile; × 1800. C—Anterior portion of male; × 1800. D—Spicula and gubernaculum, ventral view; × 2400. E—Female head *en face*; × 2400. F—Cuticular pattern on posterior portion of female; × 1800. G—Anterior portion of testis; × 2400. H—Developing female larva; × 540. I—Female just after last moult; × 540. J—Adult female showing structure of oviduct and spermatheca; × 540. K—Adult gravid female; × 540.

and are deposited before segmentation (Fig. 1, K). Ovary with two flexures, the terminus lying well forward beside the spear.

Male: Length 0.25–0.29 mm; $\alpha = 30$; $\beta = 3.5$; $\gamma = 11$; T–37%.

Body somewhat more slender and more uniformly cylindrical than that of the larvae. Cuticle with relatively coarse annules that are not ornamented by tubercules as are those of the female. Wings marked by three faint lines. Deirids conspicuous, located about opposite the anterior end of the intestine. Spear apparently lost at last moult. Testis single, composed of a small cap cell followed by two large spermatogonia. About 8 spermatocytes usually are present from which the many spermatids develop (Fig. 1, G). Spicula elongate, curved, cephalated. Gubernaculum thin, slightly curved, refractive. Bursa narrow, thick, apparently formed by ventro-submedian evaginations of the cuticle which do not extend past the ventral contour of the body and are, therefore, easily overlooked from a lateral view (Fig. 1, B). Viewed ventrally these cuticular extensions are seen to form a shallow, ovate depression surrounding the anal opening.

RELATIONSHIPS

Cacopaurus and *Paratylenchus* obviously are much more closely related to each other than they are to other members of the *Criconematinae*. The males are especially similar in structure; both lose the spear at the last moult and have practically identical spicula, gubernacula and testes. The single male of *Paratylenchus* in the writer's collection appears to possess similar, but more obscure, bursal structures than those of *Cacopaurus*. If these thick, cuticular evaginations are homologous with the usual membranous bursae of other tylenchs, they may indicate that bursae are special ventrosubmedian outgrowths of the cuticle and not developments of the lateral alae or wings, a theory which has been advanced by other workers. Similar thickened bursa-like structures are characteristic of the Genus *Thada* Thorne, 1941, the only instance of its kind heretofore observed by the writer among the *Tylenchinae*.

The young larvae of *Paratylenchus*, which frequently are found living free in the soil, have no well developed spear while in the youngest forms of *Cacopaurus* this organ is well developed. There is considerable similarity between the very young females of the two genera but the external characteristics of the obese adults of *Cacopaurus* show a wide divergence from their common ancestry.

Extension of our knowledge of this group of nemas eventually will necessitate the establishing of a family Criconematidae under which a new subfamily must be established for the reception of *Paratylenchus, Cacopaurus* and other related genera which doubtless will be discovered.

LIFE HISTORY AND HABITS

Cacopaurus pestis appears to have a very simple life history. Collections made in May, 1942, contained larvae and females in all stages of development, indicating that there is a series of overlapping generations as in many other plant-parasitic nematodes.

The sessile females deposit their unsegmented eggs adjacent to the roots and upon hatching the sluggish moving larvae find themselves near a suitable food supply and many of them immediately begin feeding. Frequently several females are found in a group, the progeny of a single mother. They may be located on the surface of the root, beneath the edge of a bark scale or in tiny, pustule-like masses overlying small pits in the bark.

Examination of root sections reveals that the epidermal cells are punctured by the female nema and an irritating salivary product injected which causes the cells to become two or three times their normal size and secrete a substance which distends their walls until they rupture. The resulting exudate wells up about the

inches, while in the next 17 years, 1919–1935, there had been an accumulated deficiency of 34.61 inches. But of particular interest was the fact that during the five years preceding 1936 there was an accumulated deficiency of 37.81 inches. Irrigation water from wells was applied during the summer months but in the winter and spring, when rainfall was depended upon, there were many periods when precipitation was far below normal and it is quite probable that the trees suffered for lack of water at these times.

This rainfall deficiency averaged only a small amount each year and may not appear sufficient to have been of importance. It must be kept in mind, however, that all orchards eventually reach a point where the supplies of moisture and available plant food elements and the tree requirements approach an equilibrium. In such instances a deficiency in moisture combined with root destruction by nematodes and other organisms may produce a combination of adverse factors which causes a general deterioration of the tree, resulting in a reduction of fruit, leaves, twigs, and even small limbs. Instances of this nature have been observed in citrus and olive trees attacked by the citrus nematode, *Tylenchulus semipenetrans* Cobb, and in apple, cherry, fig, and walnut orchards attacked by the bisexual form of the meadow nematode, *Pratylenchus pratensis* (deMan) Filipjev. This condition is, for want of a better name, frequently included under the classification of "dieback" and is widespread in central and southern California where the losses annually reach hundreds of thousands of dollars.

Injury was centered in the west end of the orchard where in 1942 a count of 136 trees (a block of 8×17 rows) showed that 41 had died, 66 were in various stages of obvious decline and only 29 were normal or nearly so. Declining trees also were scattered over the remainder of the orchard but not in definite areas. The large percentage of injured trees in the west end of the orchard may indicate that the nematode is indigenous and that the heavily damaged area represents the site of a colony which had lived on some native host plant before the field was placed under cultivation and had eventually transferred to the walnuts. Previous to the walnuts, grain and alfalfa were the only crops grown and therefore the possibilities of introduction from outside sources are remote. Neither is the field in the outwash or overflow area of any stream by which the nematodes might have been transported from other localities.

There is, of course, a possibility that the nematodes were introduced from the nursery where the seedlings were grown. This nursery is still in existence but there has been no opportunity to inspect the present plantings or stock originating there during the past 40 years. Presuming that the nursery was infested, the concentration of declining trees at the west end must represent stock from a heavily infested lot which chanced to be planted in that particular portion of the orchard.

Of special interest were collections of roots from five Mayette trees budded on *Juglans hindsii* rootstocks with which dead seedling trees of the original planting has been replaced. These roots were not infected although they were growing in what should have been heavily infested soil. This indicates that *J. hindsii* may be immune, or very resistant, to the attack of *Cacopaurus pestis*.

Cacopaurus, nov. gen.

Diagnosis.—Criconematinae. Larvae armed with a well developed spear. Female body obese, immobile, generally distorted in form, attached to host by the unusually long spear. At senility the female forms a brownish colored empty case which remains attached to the root of the host. Males slender, active, losing the spear at the last moult. Males and females both about equal in length to the larvae from which they developed. Annules of female cuticle ornamented by minute tubercules; male cuticle marked by plain striae. Bursa small, obscure, appearing to be only a slight evagination of the cuticle. Ovary single. Testis one.

Cacopaurus is most closely related to *Paratylenchus* from which it is distinguished by the obese, distorted body of the female, by the tubercules formed on the annules of the female cuticle and by the sessile type of its parasitism.

Type species.—*Cacopaurus pestis*, nov. spec.

Type host.—Walnut, *Juglans regia* Linn., variety Mayette.

Cacopaurus pestis, n. sp.

Diagnosis.—Larvae: Length 0.2–0.25 mm; width 10–13 μ. Body widest near the base of the neck. Tail uniformly conoid to the slightly blunt terminus. Striae and wings obscure. Spear 40–65 μ long, well developed even in the youngest larvae observed. Intestine packed with coarse variable sized granules; rectum and anus inconspicuous.

During development neither males nor females make more than a slight increase in length; in fact, when moulting they may become considerably shorter than the original larvae. When the female larva inserts its spear into the root cells and begins to feed it first assumes an arcuate form and then gradually becomes more and more obese (Fig. 1, G). At least three moults occur and each time the spear is retracted from the root and can be seen attached in the cuticle beside the anterior end of the developing larva. The length of the spear greatly increases during this growth period until it may occupy half of the body length.

The larva probably does not move far, if at all, from the point where it began feeding for the developing body is practically immobile. The tail becomes shorter and more bluntly rounded; striae and wings are easily visible, and the annules begin to develop minute, refractive elements.

Adult ♀: Length 0.20–0.26 mm; width 35–43 μ. Body obese, immobile, sometimes straight but usually curved, arcuate or folded (Fig. 1, J, K). At senility the body becomes light-brown in color and remains attached to the root of the host as an empty collapsed case.

Cuticle marked by striae which average about 1 μ apart near the middle of the body. Annules ornamented by minute, refractive elements or tubercules (Fig. 1, F). Wing areas marked by three lines extending from near the middle of the neck to the terminus, each line composed of two rows of minute elements. The wing area widens near the tail to an ovate field on which the cuticular elements are irregularly arranged. Beneath this field is a circular organ reminiscent of the scutellum of *Hoplolaimus*. Phasmids not definitely seen but apparently they are certain minute refractive points with fibrous connections leading inward to the circular organs just mentioned.

The very small lip region bears six obscure lobes which are visible only *en face*. Labial papillae and amphids apparently tylenchoid but so minute as to be visible only on the most favorable specimens. The first two annules adjacent to the lips are somewhat hexagonal and not marked by elements. Cephalic framework very obscure with small sclerotized structures surrounding the vestibule. Spear of unusual proportions, 40–110 μ in length, very slender. Esophageal lumen much convoluted between the spear and median bulb, especially when the spear is retracted. Median bulb with strong valvular apparatus. Isthmus and basal bulb plain with weak musculature. Intestine made up of only a small number of cells, each with conspicuous groups of variable sized granules. Rectum and anus practically invisible on most specimens.

From the broad, depressed vulva the vagina immediately enlarges to a spacious, thick-walled chamber. Oviduct composed of several large cells, the ventral one adjacent to the ovary forming a spermatheca in which spermatozoa generally are thickly packed (Fig. 1, J). Eggs are huge when compared to the size of the body

nema and apparently it is upon this that it feeds and not the original cell contents. As additional cells are ruptured a small pit may be formed in the epidermis of the roots and the nema completely covered by the exudate. Larvae produced from eggs deposited in this mass doubtless begin feeding upon it and as they develop some of them attack the walls of the pit and as these cells break open they force their way into them, causing minute scales of bark to begin forming. In some instances it appears as if many of the nemas do not attack cells but live on the exudate produced by other members of the colony. As the colony increases in size and the individuals penetrate deeper into the epidermal tissues they may almost reach the underlying parenchyma cells.

Further investigations may reveal that the nemas do penetrate entirely through the epidermis of very young roots and reach the parenchyma. This would be a much more serious type of injury and doubtless would result in almost immediate death of the root. That complete destruction of the roots does commonly occur is demonstrated by the great quantities of dead roots which are recovered on the soil screens when samples from infested trees are washed.

Males were not observed feeding and intermediate stages were absent from the material examined. Consequently nothing is known concerning the number of moults or the details surrounding the degeneration of the spear.

TECHNIQUE USED IN IDENTIFICATION

This very small species is easily overlooked when roots are being examined. A successful technique consists of first carefully washing the roots free of soil and then rubbing them briskly between the fingers in a small amount of water. The residues are then examined under the higher powers of the binocular and, if this species is present, the brown shrunken female cases will be found, usually in company with a few larvae, males, and developing females. Only the brown cases will be found on dead roots.

Specimens attached to roots are best observed under direct illumination from a strong lamp for it is very difficult to see them in ordinary daylight even under the higher powers of the binocular.

A new trematode of the genus *Polystoma* (Monogenea: Polystomatidae) from *Xenopus laevis* Daud. EMMETT W. PRICE, U. S. Bureau of Animal Industry.

Among some helminths forwarded to the Bureau of Animal Industry for identification by Dr. A. C. Walton, Knox College, Galesburg, Ill., was a single specimen of a polystome trematode which, according to the label, had been collected near Cape Town, Union of South Africa. A comparison of this specimen with the descriptions of the other representatives of the genus shows it to be different in several respects, and it is described herein as a new species.

Polystoma xenopi, new species
Fig. 1, A–B

Description.—Body ovoidal, 1.7 mm long, exclusive of haptor, by 0.87 mm wide near equatorial portion of body proper. Anterior haptor sucker-like, about 156 μ in diameter; posterior haptor somewhat cordate, 420 μ long by 530 μ wide. Haptoral suckers 6 in number, 150 μ in diameter, without heavy cuticularization. Large haptoral hooks 162 μ long, with deeply cleft roots; larval hooklets probably 16 in number, 4 observed between posterior pair of suckers and one in each sucker. Pharynx about 105 μ in diameter; intestinal branches with numerous, large medial and lateral diverticula, without anastomoses and not united posteriorly. Genital aperture median, about 500 μ from anterior end of body; cirrus 72 μ in diameter, armed with apparently 14 spine-like hooks. Testes numerous, mostly obscured by

intestinal diverticula. Ovary comma-shaped, to left of median line; vitelline follicles numerous, extending from level of pharynx to posterior end of body proper, some follicles apparently in haptor; vaginae and vaginal apertures not observed. Uterus dextral, containing a single egg measuring 235 μ long by about 95 μ wide.

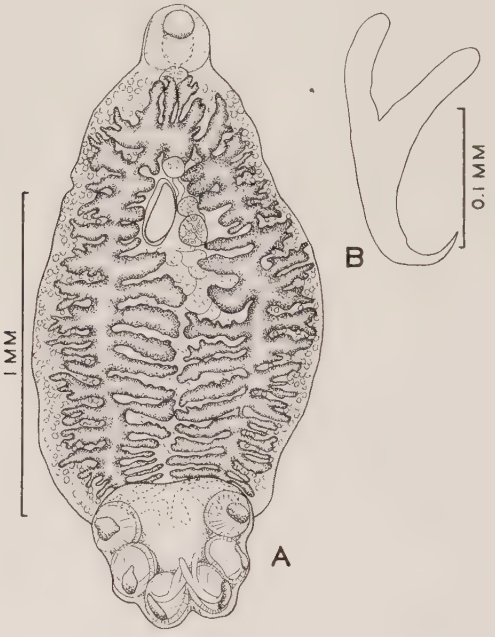

Fig. 1. *Polystoma xenopi.* A—Complete worm, ventral view. B—Large haptoral hook.

Host.—*Xenopus laevis* Daud.

Location.—(?) Urinary bladder.

Distribution.—Africa (near Cape Town, Union of South Africa).

Type specimen.—U.S.N.M. Helm. Coll. No. 45337.

Polystoma xenopi most closely resembles *P. gallieni* Price (1939, Proc. Helminth. Soc. Wash. **6**(2): 80–92) from *Hyla arborea* var. *meridionalis* in France and *P. africanum* Szidat (1932, Ztschr. Parasitenk. **4**(3): 506–521) from *Bufo regularis* in Africa, in lacking prehaptoral intestinal anastomoses. It may be distinguished from both of these species, however, in having more numerous and prominent medial intestinal diverticula and in lacking the usual fusion of the intestinal branches posteriorly. Further differentiation of *P. xenopi* from the other species of *Polystoma* is shown in the following key:

Key to species of the genus Polystoma

1.	Prehaptoral intestinal anastomoses present	2
	Prehaptoral intestinal anastomoses absent	6
2.	Prehaptoral intestinal anastomoses not reticulate	3
	Prehaptoral intestinal anastomoses reticulate	4
3.	Medial intestinal diverticula few, short	*integerrimum* (Froelich)
	Medial intestinal diverticula numerous, relatively long	*rhacophori* Yamaguti
4.	Large haptoral hooks robust	*naevius* Caballerao and Cerecero
	Large haptoral hooks relatively slender	5
5.	Roots of large hooks deeply cleft	*nearcticum* (Paul)
	Roots of large hooks not deeply cleft	*ozakii* Price
6.	Vaginal apertures conspicuous	*africanum* Szidat
	Vaginal apertures inconspicuous or (?) absent	7

7. Medial and lateral intestinal diverticula relatively few, short ..... *gallieni* Price
Medial and lateral intestinal diverticula numerous, relatively long
xenopi, n. sp.

A redescription of *Heterobilharzia americana* Price (Trematoda: Schistosomatidae). Emmett W. Price, U. S. Bureau of Animal Industry.

Recently Dr. H. L. Van Volkenberg, School of Veterinary Medicine, Agricultural and Mechanical College of Texas, College Station, Tex., forwarded to the writer a number of specimens of helminths for identification. Among these were some trematodes that had been collected at Edna, Tex., by Mr. B. White from the "liver" of a raccoon sometime in December 1942. An examination of the specimens, comprising about 22 males and 3 females, showed them to be the same as a species described by the writer as *Heterobilharzia americana* (Price, 1929, Proc. U. S. Nat. Mus. 75, Art. 18; 1–39) from a *Lynx*. In the original description only two male specimens were available. The additional material from the raccoon makes possible a description of the female and the addition of some details to the description of the male.

Heterobilharzia americana Price, 1929
Fig. 1, A–E

Description.—Male 3.7 to 6.7 mm long by 1 to 1.25 mm wide, with postacetabular portion infolded to form the gynaecophoric canal. Cuticula covered with small, blunt, tubercle-like spines. Oral sucker subterminal, 332 to 465 μ in diameter, acetabulum pedunculated, 448 to 630 μ in diameter. Esophagus 490 to 510 μ long, its posterior third surrounded by unicellular glands, bifurcating near anterior rim of acetabulum and forming intestinal ceca which proceed posteriorly in a slightly sinuous manner and terminate either blindly or unite to form a short common cecum. Genital aperture slightly sinistral, about 415 μ from posterior rim of acetabulum; cirrus pouch elongate, directed transversely and containing a small seminal vesicle; vas deferens slender, extending in median field between testes and cirrus pouch; testes 60 to 80 in number, arranged in two more or less irregular rows in posterior third of body. Excretory bladder short, Y-shaped, terminating in a slightly subterminal excretory pore.

Female slender, 9 mm long by 0.58 mm wide in postovarial part of body. Cuticula, especially of preovarial portion of body, armed with minute blunt spines. Oral sucker subterminal, 50 μ in diameter; acetabulum about 90 μ in diameter, 0.5 mm from anterior end of body. Esophagus about 215 μ long, its distal third surrounded by unicellular glands, bifurcating at level of posterior rim of acetabulum; intestinal ceca dilated at irregular intervals in preovarial region, and having numerous medial and lateral, more or less dendritic, diverticula in postovarial region, with several (at least 6) commissures in posterior eighth of body, and terminating in a short common cecum. Genital aperture median, immediately posterior to acetabulum; uterus slightly tortuous, in median field; Mehlis' gland and ootype immeditaely preovarial; seminal receptacle about 70 μ long by 90 μ wide, immediately postovarial; Laurer's canal present, opening medially and dorsally; oviduct slender and tortuous, extending from posterior tip of ovary to ootype. Ovary slightly preequatorial, consisting of 4 loops. Vitellaria consisting of small follicles dispersed between intestinal diverticula from level of seminal vesicle to end of intestinal cecum. Egg thin shelled, oval, without spine, about 78 μ long by 50 μ wide, and containing a miracidium.

Hosts.—Lynx rufus floridanus and *Procyon lotor*.

Location.—Mesenteric and, probably, portal veins.

Distribution.—United States (Florida and Texas).

Specimens.—U.S.N.M. Helm. Coll. 14532 [type (male)], 45401 [collateral-type (female)] and 45402.

The male specimens from the raccoon are considerably smaller than the ones from the *Lynx* on which the original description was based, those from the *Lynx* being 10 to 14 mm long and those from the raccoon, 3.7 to 6.7 mm long. This difference, while considerable, may be accounted for, at least in part, by contraction due to methods of fixation. A further difference noted in the raccoon specimens

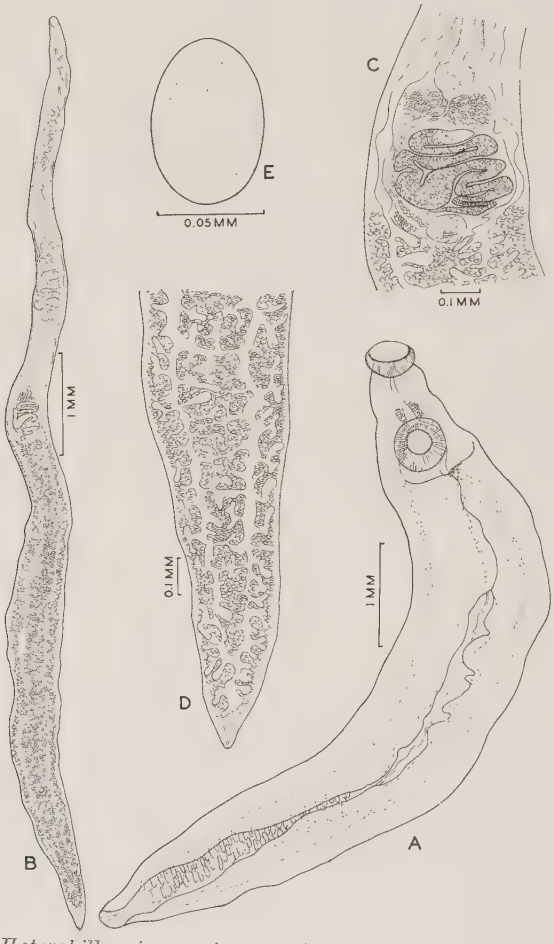

Fig. 1. *Heterobilharzia americana.* A—Male, complete worm, ventral view. B—Female, complete worm, dorsal view. C—Female genital complex, dorsal view. D—Posterior end of female. E—Egg.

was that the intestinal ceca in several of the specimens had failed to unite posteriorly. These differences, however, are not considered as sufficient to regard the specimens from the two hosts as distinct species.

In the original description the type host was given as "*Lynx* species, probably *L. uinta.*" This probability has since been checked and found to be in error. According to the records of the U. S. National Museum the animal from which the original material was collected was a specimen of *Lynx rufus floridanus* that had been taken in Florida.

The occurrence of *Syngamus trachea* in mature chickens. Louis Olivier, U. S. Bureau of Animal Industry.

Recently, Crawford (1940, Indian Jour. Vet. Sci. and Animal Husb., **10**: 293–294), in reporting observations on the occurrence of *Syngamus trachea* in Ceylon, stated: "The number of pairs of worms found in the tracheas of adult fowls is generally small, as a rule not more than two or three pairs, but not infrequently adult hens have been seen on poultry farms exhibiting typical clinical symptoms. . . ." Crawford added that in Ceylon the adult fowl is considered a most important factor in maintaining and spreading infection. In the United States it is considered unusual for mature chickens to harbor gapeworms, and no heavy infections with the parasites or symptoms of the disease that they cause appear to have been reported. Ransom (1921, U. S. Dept. Agric. Bull. 939) demonstrated experimentally that as chickens grow older they become increasingly resistant to infection with *Syngamus trachea*. Nevertheless, in this country Waite (1920, Maryland Agric. Expt. Station Bull. 234) and Ransom, and Morgan (1931, Jour. Helminth. **9**: 117–120), in England, have shown that adult chickens may occasionally become lightly infected. In this connection it is interesting to report the occurrence of *Syngamus trachea* in seven mature chickens, one of which was severely infected and exhibited typical clinical symptoms.

Thirteen chickens, 11 Rhode Island Reds, 1 New Hampshire Red, and 1 S. C. White Leghorn, were secured through the kindness of Mr. G. C. Roe, a worker in the Food and Drug Administration stationed at Beltsville, Md. Twenty-three days after they had been placed on soil known to be contaminated with the eggs and larvae of gapeworms, one of the birds, an 11-month-old New Hampshire Red, was observed to be gaping. Syngamiasis was suspected, and when the bird was autopsied two days later the trachea contained 94 pairs of worms. Subsequently, the droppings of the 12 remaining birds were examined by salt flotation and those from 6 of the birds contained *Syngamus* eggs. The 6 birds were lightly infected and none showed symptoms of syngamiasis. All of the infected birds, except the one from which 94 pairs of worms were recovered, were 1 year old or older and all had been on an adequate diet.

The discovery of *Syngamus trachea* infections in 7 of 13 adult chickens confirms the observations that mature chickens can harbor *Syngamus*. Moreover, the relatively high incidence of the parasites in the birds exposed to the infection suggests that under certain conditions, adult chickens may serve as reservoirs of infection and be an important factor in the spread of the disease.

The efficacy of barium antimonyl tartrate for the removal of gapeworms from pheasants. Everett E. Wehr and Louis Olivier, U. S. Bureau of Animal Industry.

Of the worm parasites occurring in pheasants reared in confinement, the gapeworm, *Syngamus trachea*, probably causes the greatest annual mortality. Losses from gapeworms among pheasants reared under confinement have been reported a number of times within the past few years. One of the most serious outbreaks occurred in the State of Washington during the summer of 1939, the State Game Commission reporting a loss of 2,000 birds, approximately 20 per cent of the total, from gapeworm infection on four of its Game Farms. Further evidence of the importance of the gapeworm is given by Beaudette (1942) who stated that in New Jersey this parasite is proportionately more common in pheasants than in domestic poultry.

Since Wehr, Harwood and Schaffer (1939) showed that barium antimonyl tartrate, when inhaled as a dust, was about 98 per cent effective for the removal of

gapeworms from chickens, and subsequent tests on both chickens and turkeys showed an efficacy of about 95 per cent, it seemed desirable to test this drug on pheasants to determine whether it could be used as a practical means of treating gapeworm disease in these birds. The purpose of this paper is to present the results of this investigation.

PROCEDURE

Ring-necked pheasants used in the experiments reported herein were obtained as 2-day-old chicks from the Loyalsock State Game Farm, Loyalsock, Pennsylvania, through the courtesy of Mr. Richard Gerstell, Chief, Division of Propagation and Research, Pennsylvania State Game Commission. For the first 6 weeks the chicks were brooded in electric batteries such as are used for rearing chickens and turkey poults. They were then put on the floor of a heated room the windows and door of which were screened and the floor covered with wood shavings; the latter were changed frequently to minimize the possibility of the birds acquiring an extraneous parasitic infection.

At the time the birds were used in the experiments they were either 62 or 81 days old. Following the administration of embryonated eggs and larvae of the gapeworm, at least 2 weeks were allowed for the worms to reach the trachea and become established.

The eggs and larvae used to infect the birds were obtained by removing the uteri from gapeworms collected from the tracheas of experimentally infected turkeys. The eggs were cultured at room temperature in tap water at a depth of 2 or 3 millimeters. The time required for the eggs to embryonate and reach the infective stage was 8 to 10 days. Many of the larvae hatched from the eggs soon after completing their development; the mixture of eggs and larvae was administered to the birds by means of a graduated pipette to which a rubber bulb was attached. From 700 to 5,700 eggs and larvae were administered to each bird.

For treatment, the birds were confined in a metal box having a capacity of 8 cubic feet, and the drug was introduced by means of a dust gun through a small opening at the top, as described by Wehr (1941). Following treatment, the birds were held for 4 days before being killed and examined for gapeworms.

RESULTS AND CONCLUSIONS

The results of the two experiments are given in table 1 which shows that only 4 pairs of living worms were recovered at necropsy from 49 treated birds while 1,154 pairs of worms were recovered from 25 birds kept as controls, the average efficacy of the treatment being more than 99 per cent.

In one group of birds in experiment 1 an efficacy of 100 per cent was obtained when only 24 grams of the drug was used for 8 cubic feet of box space. This amount is less by 6 grams than that previously recommended to produce optimum results with chickens and turkeys. The data of the present experiments are in agreement with those of earlier tests on chickens and turkeys in that exposure to the drug for not more than 20 minutes is evidently sufficient to secure a high degree of efficacy.

Immediately following treatment, the eyes of a few of the birds appeared to be slightly irritated, probably as a result of some of the powdered drug being blown directly into the eyes. However, this condition did not persist and in a few hours the eyes of the affected birds became normal. Coughing, which had continued steadily from the seventh day after infection, ceased within a few hours after the birds were removed from the treatment box. There was only a slight interruption in feeding as a result of the treatment. The control birds on the other hand continued to show pronounced symptoms of gapeworm infection until they were de-

stroyed. The coughing and other symptoms interfered with normal eating and, as a result of this, they grew less rapidly than did the treated birds.

Because of the necessary confinement in the tight box for 16 to 20 minutes during treatment, the birds may become damp and overheated, and it is recommended that following treatment the birds be placed in a warm, well-ventilated place until they become dry and cool.

TABLE 1.—*Results of experiments to determine the efficacy of barium antimonyl tartrate dust for the removal of Syngamus trachea from young ring-necked pheasants*

Exp. No.	Group No.	Birds used		No. of eggs and larvae fed each bird	Amount of drug per group	Duration of treatment	Total no. of living worms 4 days after treatment	Total no. of dead worms 4 days after treatment	Efficacy of treatment
		Number	Age when inoculated						
			Days		*Grams*	*Minutes*	*Pairs*	*Pairs*	*Per cent*
		3		700			0	4	
	1	7	62	1400	29	20	0	1	100
		1		2100			0	1	
		6		700			0	1	
I	2	3	62	1400	24	16	0	2	100
		1		2100			0	1	
		4		700			27	1	
	3	5	62	1400	None	0	83	0	Control
		1		2100			18	0	
		4		1800			0	0	
		10		1900			2	0	
II	1		81		25	17			99.9
		12		3800			1	0	
		2		5700			1	0	
		2		1800			89	0	
		6		1900			421	0	
	2		81		None	0			Control
		4		3800			370	0	
		3		5700			146	0	

From the results of the tests reported herein it is concluded that barium antimonyl tartrate is as effective for the removal of gapeworms from pheasants as it is for the removal of these worms from chickens and turkeys.

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Triethanolamine hydrochloride and mixtures of micronized, wettable sulfur with urea for the control of experimental coccidiosis of chickens. Paul D. Harwood and James E. Guthrie, Dr. Hess & Clark, Inc., Ashland, Ohio.

INTRODUCTION

During the past few years, several agents which are effective for the control of experimental coccidiosis of chickens have been described, but for various reasons none of these agents is used widely in the field. However, the laboratory demonstration of effective agents has greatly stimulated research on the therapy of coccidiosis and the hope that a useful program may soon be evolved. The discovery in our laboratory that triethanolamine and similar chemicals were capable of destroying oöcysts in the presence of chicken feces led to an investigation of the effect of triethanolamine HCl on clinical coccidiosis of the fowl. While these studies were in progress, our attention was directed to the possible value of a sulfur-urea mixture (Harrison, L. R. 1942, U. S. Patent No. 2,294,401), and this material was included.

HISTORICAL

For present purposes, a brief summary, with no pretentions of completeness, of the history of coccidiosis medication will suffice. Since workers in California advocated the use of 40 per cent of dried milk in an all-mash feed, the so-called milk-flush treatment has been used extensively. However, the investigations of Becker and his coworkers (see Becker, E. R., and Waters, P. C., 1939, Proc. Soc. Exper. Biol. and Med. **40**: 439) suggest that the effects of milk upon coccidiosis may be controlled by complex factors. Herrick and Holmes (1936, Vet. Med. **31**: 390) first pointed out the possible value of feeding sulfur, and since that time several investigators have studied the problem, especially Goff (1942, Poultry Science **21**: 23). Finally Fisher, Inkster and Biely (1940, Amer. Jour. Vet. Research **3**: 227) reported that urea was without value for the control of avian coccidiosis.

MATERIALS AND METHODS

Triethanolamine hydrochloride was made in the laboratory by adding commercial hydrochloric acid to commercial triethanolamine until the mixture was neutral to litmus. The triethanolamine employed contained from 20 to 25 per cent of diethanolamine and about 5 per cent of monoethanolamine. The triethanolamine HCl was separated from the water present by decantation, dried at room temperature and employed without further purification. The sulfur-urea mixture which was obtained already prepared, contained 50 per cent of micronized, wettable sulfur and 50 per cent of commercial urea.

The chicks were all White Wyandottes, obtained when one-day-old from a commercial hatchery. Each chick was weighed and banded when received, and the weighings were repeated on the 10th, 11th and 12th days. On the 12th day the average of the last 3 weighings was taken, and the chicks were matched by use of this average weight, one chick of each matched group being placed in each of 7 cages. Thirteen matched groups were selected, and about 20 per cent of the poorest chicks were discarded at this time. On the 15th day of age each chick was weighed and infected with approximately 50,000 oöcysts of *Eimeria tenella*. Treatment was administered by mixing the medicament in an all-mash feed, which consisted of the following ingredients: Ground corn, 180 pounds; wheat middlings, 75 pounds; meat scraps, 25 pounds; soy-bean-oil meal, 25 pounds; fish meal, 15 pounds; dried milk, 15 pounds; alfalfa-leaf meal, 25 pounds; a commercial mineral mixture, 15 pounds; and cod-liver oil, 2.5 pounds; total 502.5 pounds.

The various medicaments were given as described below; except where noted each treatment was repeated 4 times at intervals of 3 weeks:

Cage 1: Controls, no treatment.

Cage 2: 40 per cent dried milk in the mash starting on the third day before infection. In these tests enough dried milk was added to our regular mash to make the desired concentration. Because previous experience had indicated that the milk-flush treatment was unsatisfactory if given after infection, treatment with this medicament was given 3 days before infection.

Cage 3: 4 per cent triethanolamine HCl in the mash starting immediately after infection.

Cage 4: 5 per cent triethanolamine HCl in the mash starting immediately after infection.

Cage 5: 5 per cent triethanolamine HCl in the mash starting 2 days after infection.

Cage 6: 5 per cent triethanolamine HCl in the mash, starting 4 days after infection.

Cage 7: 2 per cent of the sulfur-urea mixture in the mash starting immediately after infection. As this material was not available at the time the first test was run, it was employed in only 3 of the 4 tests reported herein.

In addition to the weighings mentioned above, each chick was weighed on the 18th day and on the 26th day of age when the test was terminated.

All chicks which died during the course of the tests were necropsied to determine in so far as possible the cause of death. Three of the 351 chicks used in these tests died from causes which could not be related to the coccidial infection and were accordingly eliminated from the test. The criteria used to judge the efficacy of the treatments were: (1) the number of deaths occurring in each cage and (2) the comparative weights of the surviving chicks. As the smaller birds in each cage seemed to suffer a higher mortality than the larger birds in the same cage, the mean weight of the surviving birds in those cages suffering the heaviest mortality, showed a greater increase at the end of the experiment than was justified by the performance of the individual birds. However, as each bird in any given cage was matched by weight with a bird in every other cage used in the test, it was possible to compare the weight records between any two selected cages more accurately if comparison was limited to those pairs in which both members of the pair survived to the end of the test. In selected instances such comparisons will be reported.

EXPERIMENTAL RESULTS

It is not feasible to report in the limited space available the record of each bird used in these tests. However, the records are available at this laboratory and will be sent to interested persons on request.

As may be seen in table 1 the untreated cage suffered the highest mortality. Furthermore, the chi-square test indicates that significantly fewer birds died in cages 4 (5 per cent triethanolamine HCl starting on the day of infection) and 7 (2 per cent sulfur-urea mixture) than in cage 1 (the untreated cage). No statistically significant differences in the numbers that died were found between the remaining cages.

Comparisons of the effects of treatment on weights revealed additional significant differences. In cages 2 and 4 there were 14 surviving pairs of chicks. The chicks from cage 4, which were members of these pairs, weighed on the average 184.8 grams at the end of the tests or 21.1 grams more than the matched chicks from cage 1. This mean difference was significant. Therefore, triethanolamine HCl at the 5 per cent level prevented weight loss as well as death loss in these experimental birds. Comparison of the effects of triethanolamine HCl treatment on the weights of chicks suffering an attack of coccidiosis with the effects of milk-flush treatment on birds similarly infected is complicated by the fact that milk supports a more rapid growth rate than the basic diet. To make such a compari-

son of value for cages 2 and 4 the 26 pairs of chicks in which both members survived to the end of the experiment were selected, and the mean weight of the 26 birds selected from cage 2 was calculated for the 12th, for the 15th, and for the 18th day. Similar calculations were made for cage 4, and by use of these averages, a mean direction of growth was estimated for each of these cages. By use of regression analysis, it was possible to determine which group of chicks came nearer

TABLE 1.—*Effect of triethanolamine hydrochloride and of a sulfur-urea mixture on experimental coccidiosis (Eimeria tenella) of chickens*[a]

Test number	Cage number	Number of birds in each cage	Mean wgt. at time of selection of birds for each cage	Mean wgt. at time of infection 3 days after selection	Mean wgt. 3 days after infection	Mean wgt. 10 days after infection	Number of deaths
			Grams	*Grams*	*Grams*	*Grams*	
I	1	13	79.7	107.7	128.8	153.0	6
	2	13	79.6	109.2	132.0	185.2	5
	3	13	79.6	104.5	124.5	137.2	2
	4	12	80.8	106.3	121.9	153.3	0
	5	13	79.6	104.5	127.5	165.2	3
	6	12	78.1	101.7	121.8	145.5	6
II	1	13	82.1	105.5	123.2	174.1	10
	2	13	82.1	111.2	131.6	190.6	7
	3	13	82.2	103.3	117.7	120.0	12
	4	13	82.2	103.8	115.6	159.5	8
	5	13	82.1	103.2	121.9	170.5	10
	6	13	82.1	103.7	115.7	167.6	8
	7	13	82.2	105.2	111.2	128.4	9
III	1	13	90.4	113.5	137.5	163.4	8
	2	13	90.4	115.5	148.5	193.1	4
	3	13	90.5	111.5	132.7	168.3	1
	4	13	90.5	114.8	138.5	193.6	1
	5	13	90.4	112.8	140.6	154.6	8
	6	13	90.4	115.2	142.2	192.0	6
	7	13	90.5	114.2	128.8	193.3	2
IV	1	13	82.8	111.5	136.5	190.7	10
	2	12	82.9	110.2	142.2	199.3	4
	3	13	82.8	106.1	137.1	177.5	9
	4	13	82.8	109.5	133.4	177.2	3
	5	13	82.8	113.2	136.4	172.4	4
	6	13	82.8	108.2	134.9	144.7	7
	7	13	82.8	110.5	125.6	167.5	0

[a] Treatments employed are designated by number of the cage as follows: Cage 1, controls; Cage 2, 40 per cent dried milk in the mash 3 days before infection; Cage 3, 4 per cent triethanolamine HCl in the mash at time of infection; Cage 4, 5 per cent triethanolamine HCl in the mash at the time of infection; Cage 5, 5 per cent triethanolamine HCl in the mash 2 days after infection; Cage 6, 5 per cent triethanolamine HCl in the mash 4 days after infection; Cage 7, 2 per cent sulfur-urea mixture in the mash at the time of infection. Each chick was dosed with 50,000 oöcysts of *Eimeria tenella* when 15 days of age.

to maintaining the estimated rate of growth in spite of an inter-current attack of coccidiosis. It was found that the chicks from cage 4 (5 per cent triethanolamine HCl in the mash immediately after treatment) came significantly closer to attainment of their expected weight on the 26th day than their mates from cage 2 (milk-flush starting 3 days before infection). When a similar analysis was conducted on

18 pairs of birds, selected from cages 2 and 7, it was found that the chicks from cage 7 (2 per cent sulfur-urea mixture immediately after infection), more nearly attained by a significant margin their expected weight than the birds from cage 2 (milk-flush treatment starting 3 days before infection).

These tests were not designed to determine the effects of treatments employed on the normal rate of development of the chickens. However, examination of table 1 suggests that treatment with 2 per cent of the sulfur-urea mixture may have retarded normal development slightly.

DISCUSSION

Of the medicaments used in these tests, the sulfur-urea mixture possesses greater practical promise than thiethanolamine HCl. If used at the rate of 5 per cent of the mash, triethanolamine HCl will cost the poultryman at least 2.5 times as much as the feeding of adequate concentrations of sulfur and urea in the mash. That use of a mash containing 1 per cent of micronized sulfur may prove detrimental to chicks because of retardation of growth rate is suggested, both by our data and by data presented by Goff and Upp (1940, Poultry Science 19: 180). However, unpublished data which has been made available to us indicate that the sulfur-urea mixture at the rate of 1 per cent of the mash (0.5 per cent sulfur) is approximately as effective as the concentration of 2 per cent which was used in the tests presented in this report, and furthermore, these data indicate that the lower percentage of sulfur has little effect on the growth rate.

At present the usefulness of the urea employed in the sulfur-urea mixture may be questioned. However, in these experiments the sulfur-urea mixture fed at the time of inoculation reduced the number of deaths by two-thirds, while Goff (1942, Poultry Science 21: 155) reported that feeding sulfur, even in high concentrations at the time of inoculation, possesses very little merit. Although urea alone appears to be without value for the control of coccidiosis (*Vide infra* Fisher, Inkster and Biely), it is possible that it may prove of value when mixed with sulfur.

SUMMARY

1. Evidence is presented which indicates that triethanolamine HCl possesses some merit for the prevention of experimental coccidiosis caused by *Eimeria tenella*.

2. However, a mixture of micronized, wettable sulfur with urea appears to have more promise of practical usefulness for this purpose.

MINUTES

Two Hundred Twenty-ninth to Two Hundred Thirty-sixth Meetings

The 229th meeting was held October 21, 1942, in the U. S. National Museum. Capt. G. W. Hunter III, Maj. Cornelius Philip, Drs. Frank Enzie, A. Bascom Hardcastle, David E. Bartlett, Donald C. Boughton and A. C. Walton were elected to membership. Dr. Henry E. Ewing was reelected to the Editorial Committee of the Proceedings, his term to expire in 1945. The report of a committee appointed to recommend a schedule of meetings for the year was adopted. Drs. Wright, Schwartz and Price and Miss Doss gave brief addresses in memory of the late Dr. Albert Hassall. Dr. Wetmore was given a vote of thanks for the privilege of use of the Museum for certain of the year's meetings. Papers were presented by Philip, Spindler and Wright.

The 230th meeting was held November 18, 1942, at the Beltsville Station of the Zoological Division. Dr. Price was reelected to represent the Society in the Washington Academy of Sciences. Dr. Ellsworth C. Dougherty and Mr. C. H. Hill were elected to membership. Papers were presented by Dinaburg, Spindler, Philip, Hunter, and Shorb and Habermann.

The 231st meeting was held December 9, 1942, in the U. S. National Museum. Olivier, Price, Hammond, Boughton, Kerr, Shorb, and Spindler presented papers.

The 232nd meeting was held January 13, 1943, at the Catholic University of America. Dr. Price was reelected to the Editorial Committee of the Proceedings for a four-year term. Papers were presented by von Brand, Reinhard, Kates, and Wright.

The 233rd meeting was held February 19, 1943, in the U. S. National Museum. Dr. Marshall Hertig presented a technicolor film on Oroya fever. The following members presented papers: Schwartz, Foster, Wright, and Steiner.

The 234th meeting was held March 10, 1943, at the National Institute of Health, Bethesda, Md., Vice President Kates and Dr. Wright presiding jointly. The Treasurer's report showing a balance on December 31, 1942, of $1,074.76 was accepted. A suggestion to purchase a $1,000 War Bond was referred to a committee of the officers. Lt. C. Brook Worth was elected to membership. Papers were presented by Bozcievich, Jones, Jacobs, and Allen.

The 235th meeting was held April 14, 1943, in the U. S. National Museum. The Recording Secretary reported that to date 211 persons have been associated with the Society as active members. A special committee was appointed to consider matters related to the proposed purchase of War Bonds. The death of a member, Dr. W. A. Hoffman, was called to the Society's attention. Papers were presented by Sarles, Lotze, Highby, Johnstone, and Dinaburg.

The 236th meeting was held May 15, 1943, in conjunction with the annual picnic at the Horticulture Station of the Bureau of Plant Industry, at Beltsville, Md. The committee appointed to investigate the feasibility of investing part of the Society's funds in War Bonds recommended the purchase of five $100 Series G Bonds. The committee also recommended appointment of a committee to revise the constitution and by-laws especially as regards the financial affairs of the Society. The report was adopted and the Treasurer was authorized to purchase the bonds and the following committee was appointed to revise the constitution: Dr. Steiner, chairman, Miss Buhrer, Dr. Foster, Dr. Olivier and Dr. Dikmans. The death of a member, Dr. V. N. Moorthy, was called to the Society's attention. Officers were elected as follows: President, Dr. Mollari; Vice President, Dr. Shorb; Recording Secretary, Dr. v. Brand; Corresponding Secretary-Treasurer, Miss Buhrer. The Society adopted as a permanent policy the publication in the minutes of resolutions concerning the death of any of its members and authorized publication of the following resolutions on the death of Dr. W. A. Hoffman and Dr. V. N. Moorthy:

At its April meeting, the Society learned with deep regret of the death of one of its esteemed members, Professor William Albert Hoffman of the School of Tropical Medicine, San Juan. The date and circumstances of his death were not known to the members of the Society who had been advised a short while before the meeting of this sad, unexpected happening. Doctor Hoffman was not able to be a regular participant in the meetings of the Society on account of his location in Puerto Rico, and for this reason only a handful of members were fortunate enough to have known him well, although many members are able to recall a meeting or two that he attended, each time contributing something of value and interest, and each time eager to associate with old friends and to make new ones. His interests and research covered the entire field of parasitology, although medical entomology was his specialty. More than 40 articles on parasitological subjects of medical import were written by him. Among parasitologists and medical zoologists he will be remembered chiefly on account of his outstanding systematic work on mosquitoes and sandflies, and for his important contributions on Manson's schistosomiasis. His friends will remember him as a congenial, pleasant companion and as one who

struggled without complaint against great physical handicap. The Society deeply regrets the untimely loss of so worthy a member.

The Society regretfully records the death of one of its members, Dr. V. N. Moorthy, Mysore State Department of Health, Bangalore, South India. His death, at an age under forty, is reported to have resulted from contact with a disease he was engaged in investigating. He died in the line of duty in his chosen field of service.

In 1936, Dr. Moorthy, already the possessor of five academic degrees, came to the United States and entered the Johns Hopkins University as a candidate for the doctorate in Public Health, which later was conferred upon him. Previously, although helminthology was not his major field, he had been engaged in investigations on dracontiasis in his native land. At Johns Hopkins, he further and more intensively pursued his studies on the life history of the guinea worm and on certain parasites of copepodocidal fish. He became greatly interested in the morphology of larval and adult Camallanina and worked in this field for a time in the laboratories of the Zoological Division.

Making remarkable progress in a short time, he published a succession of valuable contributions on the subjects of his research. On his return to India, other duties prevented Dr. Moorthy from continuing his work on guinea worm infection, except sporadically. Nevertheless, he was able to report recently the results of comprehensive ecological studies on the subject.

Dr. Moorthy was capable, pleasant, friendly and unassuming. His promising career has been terminated prematurely to the sincere regret of all who knew him and the Society has suffered the loss of a prominent member.

Doys A. Shorb,
Recording Secretary.

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